AUTOBIOGRAPHICAL MEMORY, AUTOBIOGRAPHICAL KNOWLEDGE, AND POST-TRAUMATIC STRESS DISORDER

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K. T. Moake

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This work is dedicated with love to mum and dad

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ABSTRACT

The proposal that the information contained in a traumatic event can be differentially processed and that maladaptive processing will result in the signs and symptoms of post-traumatic stress disorder (PTSD) is the basis of current information processing theories of the disorder. This thesis proposes that in order for information processing theories of PTSD to account for the current research findings into the processing of traumatic information they need to consider the nature and structure of peoples' memories for personally significant events (Autobiographical Memories), and by doing so, it is hoped to demonstrate the utility of memory processes for understanding the development and maintenance of PTSD. Chapter One considers the diagnosis and symptoms of PTSD and focuses on the current research into PTSD and memory. Recent experiments have found that people with PTSD attend to threat-relevant information in a biased manner, which is possibly determined by the current (life-goal) concerns for that individual. Such attentional biases interfere with a persons ability to perform other cognitive tasks and may be the basis for the re-experiencing of traumatic events which is a central symptom of PTSD. As well PTSD patients are characterised by an overgeneral memory for other non-traumatic events. An inability to recall non-traumatic memories may be partially responsible for the maintenance of the disorder and it has been suggested by researchers that overgeneral memory is related to emotional numbing in PTSD (another primary symptom of the disorder). Chapter Two evaluates information processing theories of PTSD in terms of how they account for memory processes. The main finding of this evaluation is that while information processing theories implicitly implicate memory processes and structures they do not explicitly attempt to account for them. Chapter Three considers the current findings of theory and research into the organisation and structure of Autobiographical Memory and the ways in which these factors are represented in information processing and in the processing of information from traumatic events in particular. This study concludes that motivations, emotions, and self-concepts are used to encode, store and retrieve information about personally significant events and are central to the processing variables involved in PTSD. These variables are evidenced through the research into PTSD and memory and by the work on the organisation and structure of autobiographical memory. Lastly areas for future research and theory are identified.

In silence. Memory is strong

T. S. Eliot

CHAPTER ONE

POST TRAUMATIC STRESS DISORDER

Introduction

While people have observed the psychological effects of trauma for hundreds of years, it was not until 1980 that these effects were classified as a diagnosable disorder. This collection of symptoms was termed Post Traumatic Stress Disorder (PTSD) in the DSM-III (American Psychiatric Association, 1980), where a number of primary diagnostic criteria were identified. Since 1980 the increase in the amount of research and theory in this area has led to a better understanding and refinement of etiology, diagnosis and related issues. As an understanding of these areas is crucial for a through evaluation of theory, symptoms and related issues will be reviewed in the following chapter.

Diagnostic Criteria

From the first official classification of PTSD in 1980 there have been two successive updates, the DSM-III-R in 1987 and the DSM-IV in 1994. The DSM-IV identifies six clusters of symptoms and criterion, all of which must be present for the diagnosis of PTSD to be given. These criterion are: (1) the experience of a traumatic event; (2) re-experiencing of the event; (3) avoidance of reminders of the event and numbing of general responsiveness; (4) increased arousal; (5) a specified duration of responding, and (6) impairment to other areas of functioning.

The Traumatic Stressor

It should come as no surprise that the first criterion for the diagnosis of PTSD is the experience of a traumatic event. To meet this criterion in the

DSM-III-R a person must have "experienced an event that is outside the range of normal human experience and that would be markedly distressing to almost anyone". In the DSM-IV this criterion has been dropped so that the traumatic event no longer has to be outside the range of normal human experience. This reflects the belief that the events which can lead to PTSD are not as unusual as was once thought. In some instances they are merely shocking and uncommon experiences for an individual who is undergoing them for the first time. The alteration in the criterion also implies that PTSD involves a pathological response to a traumatic experience rather than a normal or adaptive reaction to an overwhelming experience.

In the DSM-IV exposure to the traumatic event must have involved experiencing, witnessing or being confronted with a situation where there was an actual or perceived threat to ones life or limb, or to the "physical integrity" of ones self or that of others. From the DSM-III-R to the DSM-IV an increasing emphasis is placed on threat. The importance of peoples' perceptions of trauma will be taken up when we consider theories of PTSD.

The remaining symptoms of PTSD can be summarised into three categories: intrusion, avoidance, and hyper-arousal.

Intrusion

This group of criterion is arguably the most important because they clearly differentiate PTSD from other psychological disorders (Creamer, 1993). Re-experiencing the traumatic event can take a number of different forms such as intrusive memories of the event (images, thoughts and/or perceptions); dreams or nightmares that involve facets of the event; acting or feeling as if the event were recurring, or intense psychological distress when reminded of the event. Psychological distress can be initiated by either *external cues* (smells, sounds, surroundings similar to those involved in the traumatic event) or *internal cues* (such as cognitions or high physiological

arousal). Lastly there may be a physiological reaction when exposed to situations that remind one of the event.

Peterson, Prout, and Schwarz (1991) argue that it is not surprising that one of the hallmarks of PTSD is the re-experiencing of trauma. They refer to Epstein (1990) who proposed that the re-experiencing of trauma has an adaptive value. The "experience" of a trauma can be overwhelming, and the re-experiencing of symptoms uncomfortable because of the emotions, feelings and thoughts that they produce. However, in order to consider the full implications of an event it must be re-examined. An individual cannot re-examine an event without first calling it into consciousness in some form. Only by doing this can alternate beliefs, behaviours and assumptions be considered.

Thus it is argued by some that the occurrence of intrusive thoughts is not in itself pathological. Rather it is the attempt to prevent this process, through avoidance behaviours that results in pathological reactions. By avoiding reminders of the trauma one does not bring about healthy resolution. The traumatic material has simply been shunted out of consciousness.

When someone is able to talk through their feelings about what occurred, when they can find meaning in the event, then they are more likely to come to an "adaptive resolution". The intrusive material tends to stop only when there remains nothing left to learn from it (Epstein, 1990).

Avoidance and Emotional Numbing

Re-experiencing parts of the traumatic event can be highly disturbing. This results in the individual avoiding reminders of the event and sometimes in withdrawing from the world.

Symptoms in this cluster include avoidance of conversations, thoughts and feelings associated with the trauma. Avoidance can also take the form of evading activities, places or people who remind one of the event. The

typical course of PTSD includes repeated phases of intrusive and avoidance symptoms.

Numbing of responsiveness can be observed as a diminished interest in previously significant activities, feeling detached or estranged from others, a restricted range of affect, and the feeling or belief that one's future is foreshortened.

Another common symptom is memory loss. This manifests as an inability to account for periods of time or an inability to recall certain aspects of the trauma. These symptoms are seen as signs of avoidance behaviour.

MEMORY AND TRAUMA

There are few studies that directly investigate memory for trauma-related information even though re-experiencing stems from the memories of traumatic events. However, recently several studies have been conducted which have attempted to investigate this area.

Zeitlan and McNally (1991) tested explicit and implicit memory biases for threat-related information using the stroop color-naming task. The objective of these studies is to determine how traumatic information is represented in memory and how the representations of PTSD patients differ from those people without PTSD. The subjects of the study included Vietnam veterans with and without a diagnosis of PTSD. The researchers found that PTSD is *not* associated with a retrieval deficit for threat-related information. In fact PTSD patients do not (or cannot) engage in avoidance on explicit memory tasks. They also found poor overall memory for information not related to the trauma. This concurs with clinical observations of PTSD. Patients often present with problems in concentration and memory in general, but show no problem in recalling the details of the traumatic event. Zeitlan and McNally propose that this is the result of chronic processing of threat information which prevents the processing of other memories.

The subjects with PTSD also showed an implicit memory deficit for combat words (a form of threat-relevant information) which was significantly related to the severity of the disorder. This result implies that PTSD is characterised by threat representations which are highly elaborated and readily activated. Such representations are seen in other anxiety disorders, generalised anxiety disorder in particular, however a comparison of GAD and PTSD implies that this threat representation is *only* chronically activated in PTSD.

From this study Zeitlan and McNally conclude that information about trauma may be represented differently in the memory of combat veterans with and without PTSD. The nature of this representation makes traumatic memories chronically activated and readily accessible. They explain that this is a form of implicit memory which results from the activation of a cognitive representation which strengthens the internal structure (integration) of the memory. This enhances its accessibility but does not necessarily make it more retrievable. These processes (activation and integration) are relatively automatic and occur independently from the amount of elaboration that occurs at encoding (explicit memory) (Graf, & Schacter, 1985). Thus the attentional bias for threat-related information is the result of automatic rather than controlled information processing. This study indicates that cognitive representations of the traumatic event reside in a primed or partially activated state in memory. Because these "memories" are readily accessible, they could account for the *involuntary* re-experiencing symptoms found in PTSD, such as flashbacks and intrusive thoughts (Zeitlan and McNally, 1991).

This memory bias has also been observed in rape victims with PTSD (Foa, Feske, Murdock, Kozak, & McCarthy, 1991; Cassiday, McNally, & Zeitlan, 1992). Cassiday et al (1992) note that PTSD subjects show greater interference in the stroop color-naming test for positive words than for neutral

words. This implies that anxiety disordered individuals selectively process any emotional information and not just that which is related to threat.

The question remains why do anxious patients, and PTSD patients in particular, exhibit attentional biases to certain forms of information? On the one hand it could be related to the emotionality of the words (Martin, Williams, & Clark, 1991). On the other hand and as Klinger (1975) proposes, selective attention may be determined by an individual's *current concerns.* This means that cognitive-affective motivational states related to one's current goals (positive and negative) become activated and remain so until either the goal is reached or one stops pursuing it. The activation of such motivational states interferes with performance on other cognitive tasks.

Thus an attentional bias would be expected to occur with both positive and negative words in the stroop color-naming task if these words were indicators of a person's current concerns. Likewise one could expect attentional biases in non-anxious as well as anxious populations if the words in the Stroop color-naming task were related to these individual's current concerns. In fact a recent study by Riemann & McNally (1995) has found just that. Non-anxious subjects showed attentional biases to positive and negative information when the material in the task was highly personally relevant. These results indicate that there are cognitive constructs in the mind/brain which are chronically accessible (because they are related to current concerns for the individual) and which interfere with performance on other cognitive tasks. In the case of people with PTSD these current concerns (or motivations) might relate to threat.

A second study by McNally, Litz, Prassas, Shin, and Weathers, (1994) assessed autobiographical memory (our memory for events that relate to the self) in Vietnam veterans with PTSD, veterans with other mental disorders, and with well adjusted controls. The study found that PTSD patients retrieve the same amount of combat-related memories as well adjusted veterans, but

that they have a marked inability to retrieve other specific autobiographical memories of a non-traumatic nature, especially after being exposed to disorder specific information. These findings held even when the effects of depressive (but not anxiety) symptoms were controlled for. Overgenerality of autobiographical memories is assumed to be important in the maintenance of PTSD because emotional numbing, a feature of this disorder may be linked to a relative inability to retrieve specific memories (and associated emotions and coping strategies) of a positive nature (McNally et al, 1994).

It is impossible in this study to determine whether overgenerality in PTSD occurs as an antecedent or consequence of the disorder. There are two possible explanations for the effects of overgenerality. On the one hand it may result from a persons limited cognitive capacity. Intrusive memories would consume cognitive capacity preventing the retrieval of other specific memories. On the other hand it may precede exposure to combat and thus result from some other factor. There is in fact some evidence that overgenerality develops as a result of childhood trauma (Williams, in press, cited in McNally et al 1994), and that it develops through childhood strategies (carried into adulthood) of blunting the emotional impact of trauma by retrieving only those memories which are overgeneral in nature. Other explanations for overgeneral memory include the hypothesis that when traumatic events occur in childhood preferential processing is given to positive and negative events because they are traumatic or because they represent the avoidance of traumatic experiences. This results in the schematization of positive and negative events and increases the likelihood that general rather than specific memories will be retrieved in later life (Williams, 1992). Both of these explanations suppose that early traumatic experiences produces changes in the organisation or activation of long-term memory.

A third hypothesis suggests that it is problems in the functioning of short-term (working) memory that results in overgeneral memory. This theory posits that strong avoidance responses to traumatic memories take up the capacity of working memory and this prevents the patients from understanding and being able to carry out any other cognitive tasks required of them. This hypothesis is supported by the finding that greater avoidance of traumatic memories results in longer latencies to retrieve specific memories to positive cues (Kuyken, & Brewin, 1995). Despite these findings current research does not allow one to determine whether overgeneral memory is a function of avoidance of reminders of the event or whether overgeneral memory is a function of differences in the way traumatic events are represented in long-term memory. However, because of the proposed link between overgeneral memory and emotional numbing it becomes important to determine what are the structures and processes involved in memory that allows such a phenomenon to occur.

These studies indicate that there are memory factors involved in PTSD. However there has not been enough research conducted to elucidate the exact nature of these effects. What is known is that PTSD involves an attentional bias to threat-relevant information, possibly related to the current concerns of the patient (in the case of PTSD threat representations), which interferes with other cognitive tasks. As well as an attentional bias for threat-relevant information PTSD is characterised by overgeneral memory for other non-traumatic information. Overgeneral memory may be partially responsible for the maintenance of the disorder. Both of these factors, attentional bias and overgeneral memory, are important indicators of cognitive processes which current theory needs to address. Clearly more research is required in this area.

Hyperarousal

In the DSM, PTSD is classified as an anxiety disorder. This is because it involves a number of symptoms observed in anxiety disorders in general such as a persistent level of increased arousal. Increased arousal is indicated by sleep disturbances (nightmares and other disordered sleep patterns), anger and irritability, difficulty concentrating, hypervigilance and/or exaggerated startle responses.

Duration of Response

In order to be diagnosed with PTSD the DSM-III-R and the DSM-IV require that the above symptoms have been present for at least one month. Symptoms of PTSD can develop some time after the initial trauma occurred. Thus the classification of PTSD allows for a diagnosis of delayed onset if the symptoms first appeared at least six months after the traumatic event occurred. Likewise an acute diagnosis can be given for symptoms that last for less than three or more months. It is presumed that acute and chronic PTSD differ in some fundamental way and some theories of PTSD attempt to explain this difference.

Related Issues

As well as the defined diagnostic criteria there are a number of other clinical observations which are important in regard to why PTSD develops and how it is maintained. These include the importance of pre-trauma characteristics, the differential severity of PTSD symptoms, the buffering effects of social support, and the effects of predictability and controllability of a traumatic event.

CHAPTER TWO

INFORMATION PROCESSING THEORIES OF PTSD

Introduction

Any current theory of PTSD needs to explain or account for the following; the symptoms of the disorder (especially re-experiencing) and the differential severity of PTSD symptoms. It must also explain the absence of symptoms in people exposed to a similar traumatic event and the delayed onset of PTSD in some cases.

As well as these factors it must be able to accommodate current research findings such as the buffering effects of social support, the importance of pre-trauma characteristics and experiences (in particular the role of perceived controllability and predictability of the traumatic event), and the findings in the area of trauma and memory. In particular it must be able to account for the effects (or interaction) of trauma and autobiographical memory (our memory for self-relevant events). PTSD is a disorder that involves the experience and the re-experiencing of traumatic events that are by their very nature highly personally significant. It seems obvious that any adequate information processing theory of PTSD needs to be able to account for or at the very least accommodate for the research on this facet of PTSD.

Of all psychiatric disorders PTSD is the most likely to be explained by psychological constructs (as opposed to biological and genetic factors). Unlike other anxiety disorders PTSD involves the experience of a specific external event(s) and the re-experiencing symptoms of PTSD involves processing the information that this event(s) contained. As such the theories of PTSD which take into account cognitive (information processing)

factors are the ones most likely to prove fruitful in the future. It is proposed here that processing information from events involves the interaction of motivational, emotional and behavioural factors on encoding, storage and retrieval of "memories" of the event.

In this chapter I will present the theories of PTSD that attempt to explain the processing of information in traumatic situations and evaluate them in terms of how they can accommodate or explain the findings and the questions raised from the memory research into PTSD.

Horowitz (1976, 1986)

Horowitz proposes that PTSD develops when an individual is unable to incorporate information about traumatic experiences into existing cognitive schemas.

This models emphasis is on information processing and cognitive theories of emotion based on a psycho-analytic concept of trauma. An event "outside the range of normal human experience" is hypothesised to disrupt the psychological equilibrium of an individual. Resolution of this trauma involves the incorporation of traumatic information into pre-existing schemas or through the development of new schemas.

Horowitz argues that a person "experiencing" extreme traumatization cannot (or is unable) to process the massive amount of information contained in the trauma. So this information is pushed out of conscious awareness and remains in a raw, unprocessed, and active form in memory. When information is in this active state in memory it is out of consciousness but has an influence on ego functioning. Horowitz sees *denial* and *emotional numbing* as defence mechanisms that keep the memories of the trauma from overwhelming a person. These mechanisms keep the memories out of conscious awareness. However because of the "completion tendancy"[1] these memories of the trauma are called into consciousness

[1] Completion Tendency. A process whereby information taken from events is processed

briefly in the form of intrusive thoughts and images. Because these intrusions break into consciousness unexpectedly they are accompanied by intense emotions.

This "information overload" once again evokes denial and avoidance reactions. In this way oscillation will occur between periods of intrusion and periods of withdrawal until the traumatic information is fully integrated. This oscillation between denial and intrusion is seen by Horowitz as a naturally occurring part of information processing.

Intrusion can be viewed as adaptive in that its' aim is to facilitate information processing. Avoidance and emotional numbing are coping processes which control the rate at which information is processed. While excessive intrusion will overwhelm a person, excessive control of these processes (through avoidance and numbing) can prevent complete cognitive processing of the event.

When it comes to therapy the focus of Horowitz's theory is on completing the process of information processing. This will occur when the traumatic information becomes part of "long term models and inner schemata".

Critical Comments

Horowitz's theory is one of the most comprehensive in this area. It accounts for the symptoms of PTSD and is able to explain the development, maintenance and delayed onset of the disorder. However it fails to explain why some people develop PTSD and others do not.

Horowitz's model proposes that there is a mismatch of information between existing schemas and the information provoked by traumatic experiences. However as Foa and Riggs (1994) have pointed out, this theory is unable to explain the occurrence of PTSD in people with a previous history of trauma. These individuals should not develop PTSD according to

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until reality and cognitive models match. This involves either the termination of the situation or the alteration of the cognitive model to incorporate the new information.

Horowitz's theory because after processing of this information was complete, "traumatic experiences" should have been incorporated into their inner schemata. Thus being confronted with traumatic experiences in later life should not result in a mismatch of information.

Horowitz refers to the memories of the trauma as being held in an active form in memory. Besides this reference he makes no other comment about how memory processes are involved in PTSD. However, his theory raises a number of questions about the nature of peoples' memories for traumatic experiences. He argues that when we experience a trauma we are unable to process all of the information contained in the experience. If this premise is true then what are the limitations on the processing of information from events, and what factors or processes determine the kind of information that will be encoded from events and when this information will be encoded? Horowitz also argues that traumatic information is pushed out of conscious awareness and into an *active* state in memory. How does information differ when it is active or inactive? According to Horowitz this information, once it is processed, becomes part of "long term models and inner schemata". This statement implies that information about traumatic events can only be held in long-term memory once it is accommodated into pre-existing models and schemata. If this is true then where is traumatic information held before it becomes part of long-term models and schemata? Is it held in short-term or working memory? If it is, how is it held in this system, and what are the effects of this on other processes governed by working memory? Lastly how can information that is not contained in long-term memory be accessed in the way the intrusive material is? Horowitz's theory does not consider any of these questions even though they have important consequences for why memories are re-experienced in PTSD.

Foa and Kozak (1986)

Foa and Kozak developed a theory to account for fear and anxiety based on Lang's (1977, 1979) semantic memory network. It is from this theory that many current information processing theories of anxiety are based, therefore the main components of these theories will be considered.

Lang proposed that people's experiences of the environment are organised into semantic memory networks that contain three kinds of information; (1) information about stimuli, (2) information about responses to stimuli, and (3) information about the *meaning* of stimuli and responses.

Lang argues that the purpose of the memory system is to evoke behavioural responses. In memory people associate certain stimuli and behavioural responses with unwanted consequences (including emotions) and other stimuli and responses with desired consequences. Memory networks related to specific events and emotions form around these factors. In this way a memory network associated with fear can be thought of as a program for escape and avoidance behaviour.

According to Lang information is encoded from events and stored in long-term memory as schematicized, abstracted and generalised propositional information. Therefore memories (and thus memory networks) are made up of semantic propositional constructs and not representations of objects stored in memory in an analogue form. These "memories" can be accessed using either verbal or perceptual cues, and are retrieved via *constructive processes* (Neisser, 1967) where information, which has been abstracted from events and stored in long-term memory, is acted upon by some (unspecified) process whose purpose is to generate the experience of an image (Kosslyn, 1975).

Schematic memory networks, such as Lang's were first proposed by Quillian (1968). They were developed around the basic premise that knowledge in the brain is highly interconnected. A semantic network

consists of two main elements: nodes and links. Nodes refer to concepts or classes of 'things' (objects, events, actions) and links refer to the relations between different nodes. Associative knowledge (in the form of propositions) is contained in these networks at the links between nodes. Thus the information contained at a node is the association between different concepts or classes of entities. In this way semantic networks are said to represent people's beliefs and knowledge of the world, acquired primarily via verbal learning.

According to network theory, when a person remembers or engages in any mental process, the associative network is activated, and a spread of activation occurs along the links and nodes of the network. This process is assumed to occur relatively automatically and is referred to as "automatic information processing". Thus when a person is presented with a cue, the memory network is accessed. Associative spread in the memory network results in recall of associated concepts (memories). A fear memory will be accessed when a critical number of informational units from the environment is matched to units contained in one's memory structure. These 'cues' will be about either the feared stimuli, about a persons responses to these stimuli, or about the meaning attached to these stimuli and/or responses (Lang, 1979).

To Lang it is the processing of stimulus, response *and* meaning elements in these structures that distinguishes emotional from non-emotional cognitive processing. In fact he sees the aim of therapy as the reorganisation of the response elements in the emotional image unit in a way that breaks down the meanings associated with these stimuli and responses. Thus an *emotional image* is considered by Lang as a network of (semantic) propositional units containing stimulus, response and meaning elements. The propositional constructs in a memory network will be added or subtracted at each successive reconstruction of the memory. Thus what is

remembered about events will change over time as people form different associations between stimulus, response, and meaning elements in their memory networks.

Foa and Kozak contend that if a fear structure is a program to escape danger (as Lang posits) then it must contain information that stimuli and/or responses are dangerous, and thus to be avoided. Therefore for Foa and Kozak the distinguishing feature of a pathological fear structure is the information it contains about threat. What distinguishes anxious from non-anxious populations is that the fear structures of clinically anxious people contain excessive or strong response elements relating to threat (such as avoidance responses and physiological activity), and a resistance to modification. So for example, a rape victim's fear in a social situation is evoked by the meaning (a perception of threat) that is attached to the stimuli and responses involved in interacting in that situation, and from the associations (memories and meanings) that this activates in her/his semantic memory network.

Foa and Kozak believe that the persistence of fears in such memory structures results from (1) the marked structural coherence of the fear structure, and (2) from *"impairments in mechanisms for the processing of fear-relevant information"* (Foa and Kozak, 1985; my italics). According to this theory clinically anxious patients fear structures will be easier to activate than non-anxious individuals because in a fearful situation the associations they have between the stimuli, responses and the meaning elements of this situation are more coherent and strong, and thus more easily activated from memory.

Therapy in this case involves breaking down or weakening the links between stimuli, responses, and meaning in the memory networks via exposure-based therapy. This means that when the memory network is activated, by being presented with a internal or external cue, the former

associations (between the links in the network) cannot be activated and the fear associated with these relations will not be evoked.

Foa, Steketee, & Rothbaum (1989)

Foa, Steketee, & Rothbaum (1989) applied Foa and Kozak's (1986) model of fear memory networks to PTSD in order to explain the development and maintenance of the disorder.

They propose that traumatic events produce large and complex fear networks. These networks are readily activated because, through conditioning and generalisation, a large number of fear producing associations are formed. These associations which were once considered neutral and safe have now become linked with fear. This generalisation of fear leads to a feeling of unpredictability and uncontrollability in situations. Foa et al contend that these processes are important in the development of PTSD.

Foa et al reiterate that a fear structure is distinguished from other memory structures by the information that it contains about the meaning of events - danger. They suggest that traumatic events are represented as a structure in memory. When this structure acquires a meaning about the presence of danger (threat) then it will develop into a fear structure. Foa et al contend that the processing of information during a trauma is deficient because of the threat and danger present. This skews the information network towards threat and the information encoded into the network from events will be confused and disorganised.

PTSD differs from other anxiety disorders because the traumatic event is extremely personally significant and because it violates beliefs about safety (Foa et al, 1989). This means that stimuli and responses that previously signalled safety have come to be associated with the perception of threat (via classical and instrumental conditioning).

An important contention of Foa et al's theory is the importance of predictability and controllability of traumatic events. A number of studies have shown the importance of predictability and controllability in stressful situations when the consequences of failure are aversive (Masserman, 1971; Mineka & Kihlstrom, 1978; Staub, Tursky, & Schwartz, 1971; Geer & Maisel, 1972; Roth & Kubal, 1975). In particular an unpredictable trauma and a *failure* to exercise perceived control in a situation may strengthen the effects of post-traumatic stress reactions (Foa et al, 1989). When there is a loss of predictability and controllability and in the absence of safety signals a person lives in a state of chronic fear. This feeling of loss of control would make it hard for a trauma survivor to trust their reactions in situations because they no longer have safety signals to judge these situations with, and this could lead to withdrawal from activities and situations that were previously considered enjoyable.

Foe et al predict that a person is more likely to develop PTSD if a trauma occurs in what was a previously safe environment because it is more likely to violate beliefs about safety. PTSD is also more likely to develop if the line between safety and danger becomes blurred, because as research has shown, when a person is anxious they are more likely to interpret ambiguous situations as threatening (Butler & Mathews, 1983). In such cases individuals will develop exaggerated beliefs in the probability of harm (feared consequences) occurring. People who are anxious exaggerate the probability of harm occurring because they no longer have safety signals with which to interpret social situations. This results in a constant search of the environment for threats. The perception of threat in ambiguous situations is presumed to prime memory networks for activation. This implies that memories of traumatic events act to prepare an organism for escape or avoidance behaviour.

The fear structure in PTSD differs from that of other anxiety disorders in three ways: the intensity of the responses, the size of the structure, and the accessibility of the structure. The violation of safety assumptions results in large stimulus generalisation and higher order conditioning of erroneous stimuli and responses. Thus a great number of stimuli will activate the structure. This results in a low threshold for activation of the structure. It will also result in frequent bursts of arousal and re-experiencing alternating with attempts to avoid and escape such fear provoking situations.

Foa and Kozak (1986) propose that two conditions are necessary for the reduction of fear in memory networks. First all elements of the fear structure must be accessed to consciousness, (if they are not in consciousness they cannot be altered); and secondly, information incompatible with the fear structure must be presented. If one is presented with information that confirms that contained in a memory network, then fear to that object or situation will be strengthened. Likewise information that does not confirm that contained in the memory will weaken that fear structure. This occurs because disconfirming information weakens the associations between stimuli, responses, and attached meaning. Repeated traumatization will result in more or stronger associations in the memory network because each successive traumatization strengthens the associations between links in the network. This will make the development of PTSD more likely.

Because traumatic fear structures contain a large number of elements in their structures they are easily matched by cues from the environment, and thus easily activated. Foa et al argue that although the fear structures in PTSD sufferers will be easily activated they will be less likely to be activated in entirety. This occurs for two reasons; (1) more elements in the structure means that it will be harder to match all of them, and this makes it harder to extinguish fear to all the elements, and (2) large fear structures like those seen in PTSD are likely to be less cohesive (i.e. the stimulus-response-

meaning associations will be more intricate). Only those parts of the fear structure that are accessed can be altered.

Strong response elements (emotions and physiological arousal) in the memory network foster avoidance which results in brief activation of the fear structure and an absence of habituation to fear, and exposure to corrective information. Despite these factors Foa et al contend that people activate their fear structures during day to day existence. Consequently it is only the "super-avoiders" who will be able to completely prevent accommodation of some corrective information. Habituation of fear effects the meaning associated with the traumatic event and the arousal associated with response elements in the network. Short-term (within-session) habituation of fear constitutes information to a persons memory network that acts to alter the fear structure. Information about lowered arousal during re-experiencing episodes is inconsistent with response information contained in the structure (i.e. that escape and avoidance of the feared stimulus are the only ways in which to terminate anxiety). This new information about arousal weakens the links between the stimulus and response elements. The "new memory" will be less readily activated because incoming information will only be able to match the stimulus elements in the structure. Foa and Kozak (1986) postulated that within-session and long term habituation of fear are two separate processes. Only long-term habituation represents a change in a persons representation of threat. *Long-term habituation of fear will occur when the meaning associated with the trauma changes.*

Foa et al (1989) contend that the fear structures of acute and chronic PTSD sufferers may differ. Chronic sufferers memory structures may contain more stimuli elements and more intense response elements. Larger more intense memory structures would require more exposure to break down the associations. Thus those people with strong, large fear memory

structures are more likely to develop chronic PTSD because it would take longer, and it will be harder, to break these structures down.

A number of factors will interfere with the ability to process corrective information. If the disparity between the fear memory structure and the presented information is too great to activate the memory structure; because of a failure to encode new information due to avoidance behaviours or inattention; because the information contained in the exposure situation (about potential harm) does not contradict that contained in the fear memory; or because the information presented in the exposure situation is misinterpreted (cognitively biased processing of information along lines that confirm the fear memory, or, expectancy-consistent information processing).

Foa et al see social support as enhancing recovery from a trauma by encouraging the person to discuss the event. By discussing the event it will be called into consciousness and alternate beliefs and coping strategies to those originally concluded by the person can be considered.

Foa et al (1989) consider emotional numbing, distractibility, and memory loss as cognitive avoidance strategies. Avoidance will produce re-experiencing symptoms because emotional processing is prevented from occurring. Foa et al do not specify how these variables act to produce PTSD nor do they describe the processes which produce them.

They propose that the trauma needs to be highly emotionally intensive for PTSD to develop and that only intense, unpredictable, uncontrollable traumas will result in PTSD. Finally, they propose that the essential nature of PTSD is that the "meaning" (threat) associated with stimuli and responses predicts post-traumatic stress reactions. This is evidenced by the finding that perceived threat is a better predictor of PTSD than actual threat (Sales, Baum, & Shore, 1984; Kilpatrick, Best, Veronen, Villeponteaux, & Amick-McMullen, 1986).

Critical comments

While Foa et al incorporate the variables of predictability and controllability of traumatic experiences (in fact these are central components in their theory) they do not elaborate on the mechanism through which these variables help to activate the fear network, or how this may help distinguish PTSD from other anxiety disorders. The model is limited because Foa et al do not discuss in detail several important variables (i.e. the role of social support, how emotional numbing and delayed reactions arise). Likewise they do not explain why people who have experienced a similar trauma do not all develop PTSD. They suggests that perceived threat and previous experience are important in this area but they do not discuss the precise role of these variables.

Because emotional reactions to stress play an important part in Foa et al's theory the question is raised, what is the role and function of emotion in memory network formation, and in traumatic experiences in particular? Semantic memory networks such as Lang's (1977, 1979), and thus Foa et al's (1989), contend that emotions are represented by nodes in the memory network. Activating the node also activates the corresponding (or associated) emotion (Bower, 1981). For example when a traumatic event occurs links form between stimuli, responses, and attributed meanings. Fear reactions to traumatic material will occur when fear becomes associated to stimuli, responses and meanings at the nodes in the memory network. Thus accessing traumatic memories accesses the associated fear (and visa versa). However network theories such as those proposed to be involved in PTSD have problems explaining how an emotion in a memory network can be differentially activated. Semantic memory networks by themselves cannot account for how an emotional concept (such as fear) and an emotion (feeling afraid) are differentially activated from the same node in the memory network. Thus how can Foa et al's theory account for the fact that PTSD

involves *perceiving* a situation as threatening and feeling fear at the reminders of this event.

If emotion is involved in PTSD, as it most assuredly is, then how exactly is it involved? If an emotion is tagged to a memory (as semantic networks suppose) via associations at a node then blocking out the emotional experience of a trauma should also block out the memory of that trauma. This is not what occurs. PTSD patients can recall the details of the traumatic event but this often occurs with no accompanying emotion. In other words people can intellectualise their emotional experiences without re-experiencing them. Thus it would seem that emotion is related to the experience of the event but not in the way proposed by semantic memory networks.

Teasdale (1993) argues for two levels of meaning in cognitive structures: a propositional (explicit) and an implicational (implicit) meaning. Teasdale proposes that only the activation of a implicational subsystem will result in the experience of an emotion. Activation of the propositional subsystem by itself will result in memories without emotion, "cold" intellectualisation of emotional experiences. Because meaning can be applied to memories at two different levels, "propositional" semantic memory networks (like those proposed to be involved in the information processing of traumatic experiences) should not result in the experience of an emotion.

According to Teasdale's theory, mood-dependant recall (Bower, 1981) of traumatic material results from the activation of implicational codes of meaning. Thus an anxious or fearful mood will activate higher levels of meaning (implicational meaning) which accesses and primes traumatic memories for recall. Teasdale proposes that affect-related biases in information processing (like those observed in the memory research with PTSD) are better seen as the effects of generating schematic levels of information (i.e. accessing abstract information from meaning structures),

rather than generating information at the level of activation of specific constructs (memory networks). Automatic thoughts accessed from these schematic implicational levels of meaning will then mediate emotional responses.

It follows from this that therapy for PTSD needs to reflect that emotional disorders are the result of more than the explicit relations held in memory networks. Not only should the propositional aspects of the memory structure be considered in therapy, but also the implicational meanings accessed from more abstract cognitive-evaluational structures that form the basis of and determine explicit information processing.

Teasdale (1993) points out that information processing theorists tend to overlook that there are two kinds of information processing; an automatic "unconscious" and a controlled "conscious" information processing. Automatic information processing can be thought of as pre-attentive, non-conscious, rapid and effortless, subject to few capacity limitations, and it may occur in parallel, but it is also inflexible and is unable to help with the *adaptation of new or unfamiliar experiences* which cannot be assimilated into existing meaning structures. Processes which can be considered automatic are priming, recognition, associative spread, and emotional responses. Controlled information processing is considered consciously monitored or controlled, effortful, very flexible, and is used for the adaptation of new or unfamiliar information. It is also strongly capacity-limited, relatively slow and usually serial in nature. Controlled processes include selective attention, recall, rehearsal, and elaboration (Lundh, 1995). These different forms of information processing have already been implicated in the research on memory and trauma (see Chapter One). Automatic processing of information may result in the attentional biases to threat-relevant information observed in PTSD patients (Zeitlan & McNally, 1991; Foa et al, 1991;

Cassiday et al, 1992). Such biases are assumed to result in the chronic activation of intrusive material experienced by trauma survivors.

Thus, not only are there two levels at which meaning is attached to events, but there is also two ways in which information from events is used in cognitive processing. Despite the importance of these factors for information processing Foa et al make little attempt to account for them in PTSD.

Foa and Riggs (1993)

It has already been noted that Horowitz's information mismatch theory has problems accounting for the occurrence of PTSD in people with a past experience of trauma. Foa and Riggs propose a curvilinear relationship between existing schemata and the development of PTSD.

People who have experienced trauma in the past are more likely to develop PTSD after a subsequent trauma if they made negative assumptions about the world and their self-competence after the initial trauma. If a subsequent trauma contains information that confirms their negative views this will serve to strengthen their negative memory network.

Individuals will also be more susceptible to PTSD if they have never experienced trauma before. If someone views the world as safe when a traumatic event occurs they will find these views violated. Only in this situation will they suffer from the "mismatch" theory proposed by Horowitz whereby the information contained in the trauma is incompatible with their cognitive schemata of the world and their self.

People who fall somewhere in between these extremes will be less likely to develop PTSD because they can more easily accommodate the trauma and its consequences (Foa and Riggs, 1993). They hold views of the world as sometimes safe and sometimes unsafe and of their selves as sometimes competent and sometimes incompetent. Thus when a major trauma occurs they have a number of coping strategies gleamed from past experiences

along with a sense of their ability to cope with such events. It is proposed by Foa and Riggs that these factors are vulnerabilities that act to increase or decrease the likelihood of developing PTSD after a traumatic experience.

Creamer, Burgess, & Pattison, (1992)

Creamer et al proposed a model which is a synthesis and reevaluation of previous information processing models. The aim of the model was to experimentally evaluate the cognitive information-processing mechanisms of recovery. Like other information-processing theories Creamer et al believe that recovery from PTSD involves the integration of the trauma. They propose that this occurs in five stages, and that the process of recovery includes a feedback loop between intrusions, avoidance and symptom levels.

Stage One: Objective Exposure

This stage is determined by the severity of the traumatic stressor. It will be mediated by various processing variables, and is responsible for whether a person will develop PTSD or not.

Stage Two: Network Formation

Acute and long-term reactions to trauma are mediated by the meanings that people give to events. How one appraises the traumatic event will determine whether PTSD develops. Without a perception of threat the situation will not result in PTSD.

The form of the traumatic memory network will be determined by the nature of the trauma. It will include stimulus, response, and meaning propositions. The strength of the network will depend on other pre-trauma and predisposing factors (not specified). This stage is termed *network formation.* The network is formed through the processing of the stimuli present at the time of the trauma and by attaching a meaning or

interpretation to the event. Network formation will be mediated by the severity of the stressor and will determine the level of intrusions.

Stage Three: Intrusions

In this stage the memory network is activated by the presentation of information that matches in some way that contained in the memory network. Activation of this network will also activate the stimulus and response elements of the network. This will produce intrusions and the accompanying aversive response elements (avoidance, hyper-arousal).

Intrusive memories can be either adaptive (in that they promote information processing) or maladaptive (in that they produce psychological distress). Activating traumatic memories allows the stimulus-response associations to weaken and this alters the meaning attached to the event. (According to Teasdale the extinction of such propositional meanings is not enough to prevent the reoccurrence of symptoms. Implicational meanings which filter and bias information processing would also need to be addressed).

Intrusions will be adaptive if they allow the process of modification of meaning to occur, or maladaptive if they produce high arousal which prevents this process from occurring. *Network resolution processing* is assumed to be a function of the duration of exposure to the traumatic event (Foa et al, 1989). With longer exposure to memories promoting greater habituation to fear.

Unlike Horowitz (1986), Creamer et al believe that the intrusions occur prior to escape and avoidance (which they consider coping strategies), because they occur as a response to the large number of stimuli that evoke intrusions. Thus they propose that a high level of intrusion is likely to be associated with high symptom levels in the future.

Creamer et al argue that intrusions are a less adaptive way of producing recovery from trauma than being exposed to the memories via talking about

the trauma with friends and family, through therapeutic exposure, and/or by deliberately seeking out new information related to the experience. In such cases the trauma survivor is assumed to be making a conscious effort to recall the trauma. Conscious recall of memories constitutes a more controlled access to the memory network, presumably longer in duration and is thus less likely to produce avoidance reactions (Creamer et al, 1992).

Stage Four: Avoidance

Avoidance occurs in response to, and as a coping strategy, to intrusions. When high levels of escape and avoidance are occurring Creamer et al (1992) predict there will also be a persistence in psychological symptoms and that avoidance at later stages will reflect earlier levels of avoidance.

Avoidance will be influenced by levels of intrusion and individual coping strategies. If someone has traditionally used escape and avoidance they will continue to do so after a traumatic event.

Outcome

Recovery occurs through network resolution processing; which continues until there is an active modification of the memory network.

Critical Comments

While Creamer et al's model allows for the experimental evaluation of information processing theories in PTSD, it fails to account for and/or overlooks a number of factors including how and why intrusive episodes increase or decrease during the disorder and through the process of recovery.

Creamer et al note that consciously seeking out information and consciously recalling memories of the trauma is a better way of accessing the memory network than re-experiencing. The importance of this statement lies in Creamer et al's acknowledgement of different kinds of information processing. Intrusions are supposed to represent a form of automatic

information processing (Zeitlan & McNally, 1991). Such automatic processing is assumed to be responsible for priming intrusive material and for making it chronically accessible (Zeitlan & McNally, 1991; Foa et al, 1991). Presumably, this form of processing will access information contained in memory structures in a different manner to controlled information processing. Unfortunately Creamer et al do not describe how these processes act to increase intrusive thoughts and memories except for stating that controlled information processing will access the memory network for a longer duration than automatic information processing. As the research into autobiographical memory shows it may be the cue used to access memory structures, and whether the access is voluntary (controlled) or involuntary (automatic), that determines the form and the content of the memory. Both automatic and controlled information processing are determined by the nature of people's memory structures and these factors will be considered in the next chapter.

Creamer (1993)

Creamer argues that stressful life events prior to the trauma will help produce PTSD because they increase vulnerability, while low stress before a trauma will also produce PTSD because it gives a false sense of invulnerability (Ruch, Chandler, & Harter, 1980; Ruch & Leon, 1983). The research on this area is mixed. While some studies suggest that prior experience of trauma will increase vulnerability (Burgess & Holstrom, 1979), others suggest that prior experience prevents PTSD by lowering vulnerability (see review by Raphael, 1986). Possibly the important factor in whether previous experience of trauma increases or decreases vulnerability to PTSD is whether the trauma was resolved or not. If one recovers well from an initial trauma this will help prevent PTSD by facilitating coping strategies and the belief in ones competence. If a person does not recover well from a previous experience then a negative schemata will be formed or

strengthened and this will prime the memory structure for access during future traumas (Creamer, 1993).

Creamer (1993) reports that a consistent finding in the trauma research is that of previous psychiatric comorbidity (Burgess & Holstrom, 1979; Creamer et al, 1993; McFarlane, 1988). Creamer argues that previous psychiatric illness constitutes a vulnerability to PTSD which manifests in poor post traumatic adjustment. This finding is contrary to Horowitz's mismatch theory, but supports that of Foa and Riggs (1993), that previous trauma will strengthen existing negative schemata.

Processing of traumatic information (network information processing) will be influenced by peoples' past experiences and therefore by their pre-existing schemata. Creamer et al (1993) argue that people with a strong danger schemata will tend to process cues (information) from an episode which contain threat to the detriment of other stimuli. This results in a biased record of the event. If someone has a negative self-schemata then they will process information from the trauma along this bias. This will result in negative feelings related to the self such as guilt and self-blame.

People with strong "invulnerability" schemata will be bewildered by the occurrence of a traumatic event and will be unable to process it effectively. This results in a fragmented memory record. If the trauma confirms ones beliefs that 'bad' things happen but it is not my fault (flexible schemata) then this should result in a less emotionally charged memory.

Critical Comments

Creamers contention on the importance of pre-existing schemata in the development of PTSD is similar to the proposed importance of "mental contamination" in cognitive processing (Wilson & Brekke, 1994). Research by Wilson and Brekke has shown that peoples' judgements and evaluations of situations can be adversely influenced by unconscious and uncontrollable information processing and that this results in unwanted emotions,

evaluations, and behaviours. This is a form of automatic processing where individuals make use of pre-existing beliefs and expectancies to categorise incoming information. This results in three forms of selective information processing; selective exposure to situations, selective attention to facets of situations and selective interpretation of situations and behaviour. Pre-existing beliefs are used as cognitive shortcuts to filter experiences of the environment. In times of high stress or high cognitive load the information in an event that confirms what one expects will receive more attention and more processing resources than expectancy-inconsistent information. This produces judgements about situations and self-performance that are biased in an expectancy-consistent manner. This process perpetuates the pre-existing beliefs and skews the resulting memory network in an expectancy-consistent manner. The contamination of information processing of traumatic events can be primed by the presentation of stimuli (moods, prior exposure to similar cues) that form part of ones' unconscious cognitive-evaluative structures (implicational meaning structures). Because these structures are unconscious people will be unaware of and largely unable to alter how information in that situation is processed.

Jones & Barlow (1990)

By comparing PTSD with other anxiety disorders Jones and Barlow have developed a theory to account for the development of PTSD. Their model takes into account the role of biological and psychological vulnerabilities and proposes that the development of *anxious apprehension* underlies chronic PTSD.

Jones and Barlow propose that PTSD patients have a biological vulnerability to stress, which is (probably) genetically transmitted. They cite twin and family studies to support their contention. They postulate that these people inherit a predisposition to respond to stress with chronic autonomic

overarousal. They support this with research from Vietnam veterans with PTSD who exhibit a higher resting rate than controls (Blanchard, Kolb, Pallmeyer, & Gerardi, 1982; Blanchard, Kolb, Gerardi, Ryan, & Pallmeyer, 1986). If these people experience negative life events then the predisposition to respond with autonomic overarousal will be activated.

Barlow (1988) distinguishes between true, false, and learned alarms. True alarms occur when one has a fear response when faced with a life-threatening event. False alarms occur when fear is felt in a situation that is not life-threatening, and a learned alarm is a conditioned response that develops to internal and external cues. In PTSD learned alarms develop to internal and external cues present at the time of the trauma (a true alarm).

Alarms true, false, and conditioned produce anxiety reactions. Barlow (1988) conceptualises anxiety as a loose cognitive-affective structure. Certain variables (strong negative affect, and a set of preparatory behaviours for coping with situations that contain potential threat or harm) which are contained within a feedback loop, combine to produce chronic overarousal. In the course of PTSD the individual perceives the traumatic event and the instances of re-experiencing as unpredictable and uncontrollable and reacts with chronic overarousal. Chronic overarousal is accompanied by a biased processing of information. This processing is characterised by hyper-vigilance and attentional narrowing towards sources of potential threat in a situation.

Foa et al (1989) see the experience of a perceived threat and generalisation of the fear response as essential for the development of PTSD. Jones and Barlow believe that the learning of alarms is not sufficient to explain the occurrence of PTSD. They believe anxious apprehension needs to develop to alarms before the individual will show the symptoms characteristic of PTSD. Anxious apprehension is a future-oriented state of arousal which acts to prepare an organism for an action. In PTSD anxious

apprehension develops to external and internal stimuli related to the traumatic event. When anxious apprehension is occurring it interferes with the individuals ability to concentrate and perform other cognitive tasks (presumably because it takes up cognitive capacity).

This process sets up a feedback loop where hyperarousal, hypervigilance and narrowing of attentional focus increases intrusive thoughts and re-experiencing by promoting avoidance to affect-related stimuli.

Finally Jones and Barlow propose that the effects of these processes will be mediated by variables such as coping skills and social support. Although the precise means by which these variables act is unspecified, they suggest that problem-focused coping skills act by promoting a sense of control in the individual, and social support acts to buffer the effects of trauma.

Critical Comments

Jones and Barlow refer to attentional narrowing, hyperarousal, and hypervigilance as being responsible for increasing intrusive thoughts and memories but the question remains how do these variables act to increase intrusions.

Problems with suppressing unwanted thoughts have been conceptualised by Wegner (1994). He proposes that suppression of unwanted thoughts (mental control) is possible, and that it results from a two step process. First, a *monitoring process* is activated that searches for unwanted thoughts that are inconsistent with a desired mental state (goal). When an unwanted thought is found or identified an *operating process* comes into use. This process substitutes unwanted thoughts with more appropriate (goal-consistent) thoughts. However, suppression of thoughts is resource demanding, if sufficient cognitive resources are not available then suppression fails and unwanted thoughts may actually be primed, become

more accessible and thus more easily activated. This priming of unwanted thoughts will occur when demand on cognitive resources is high such as in times of high arousal or stress. When a memory cue is given to recall a thought or an image via monitoring processes, the thought is accessed in the memory network, if there is low cognitive resources the operating process which seeks to suppress these thoughts by substituting them with alternative thoughts fails and these primed (unwanted) thoughts are likely to be activated.

This highlights the importance of motivational factors (goals or current concerns for an individual) in producing or maintaining intrusions in PTSD. Another factor that may be important in increasing levels of intrusion will be an inability to recall specific memories of a non-traumatic nature - overgeneral memory (McNally et al, 1994). If these more appropriate memories cannot be accessed then they cannot be used as substitutes for the intrusive thoughts. This would be especially important when these memories and thoughts relate to behavioural actions and coping strategies.

Wegner's (1994) model of mental control and the memory research into PTSD indicate that memory, emotions and motivational factors may interact to produce chronic activation of intrusive material. Klinger (1975) proposed that attentional biases in information processing may be related to current concerns (or goals) for the individual, and a recent study by Riemann and McNally (1995) has demonstrated that current concerns act to inhibit cognitive processing in anxious and non-anxious subjects. Despite this, the role of motivations in theories of PTSD has received little attention in the PTSD research.

As Jones and Barlow have noted, it is the cues associated with the trauma that will produce re-experiencing symptoms (presumably because they activate traumatic memory structures and access this information to consciousness), this promotes anxious apprehension and avoidance

reactions. If avoidance or suppression of intrusive thoughts and memories is interrupted, then these intrusive thoughts will be primed for recall, increasing the overall level of intrusive material.

Comments on Information Processing Theories

All of the theories presented here posit that information from a trauma and more specifically the way in which a person processes this information is responsible for the symptoms observed in PTSD; re-experiencing, avoidance of reminders of the traumatic event, and emotional numbing.

A theory based on the processing of information needs to explain the underlying nature of encoding, storage, and retrieval of this information and how this information is structured in memory because presumably these are the factors that combine to produce the symptoms observed when processing fails or when processing acts in a manner maladaptive to psychological functioning (as in cases of mental contamination and mental control).

Information processing theories posit that the information contained in a traumatic memory includes attributions about a persons beliefs of the world and self. As Lundh (1995) has noted beliefs are inseparable from motivations and emotions. Traumatic events by their very nature effect and are effected by a persons view of the world and of the self. This is evidenced by the fact that the level of perceived threat in a traumatic event is a better predictor of PTSD than actual threat. This concept of the self and the world depends on a persons experiences of the world and what they expect from the world and themselves. As has already been noted such expectations act to motivate an individual and to focus the processing of information. Thus the processing of information to and from events involves the interaction of motivational and emotional as well as cognitive factors. While the emotional

component of information processing is considered by PTSD theorists (Lang, 1979), the role of motivations is often overlooked. Whether or not one develops PTSD after a traumatic event may be linked to that persons current life-goals at the time of the trauma, and how these motivations effect the processing of information from traumatic events.

The processing of information from traumatic events necessitates the access of memories from long-term memory stores. Information processing theorists propose that exposure to traumatic information is necessary for the symptoms of PTSD to dissipate. However, a person cannot be exposed to this information without first calling it into mind or "working memory". Only when it is in this structure can it be manipulated in ways that allow one to alter its meaning (in fact this is what exposure therapy attempts to do).

Images or mental representations of a traumatic event (intrusive episodes) can be either verbal (a thought) or perceptual (an image). Mental representations of events that relate to the self are autobiographical memories (Conway, 1990). Although autobiographical memories (and other autobiographical knowledge) are primary components of intrusive memories and thoughts, no theorist has attempted to delineate the processes involved in autobiographical memory and traumatic events even though research into autobiographical memory and PTSD has already begun (see research on memory and PTSD in Chapter One).

While many of the information processing theories of PTSD presented here implicitly rely on concepts related to autobiographical memory they do not explicitly attempt to account for the processes and structures that are responsible for the encoding, storage, and retrieval of traumatic memories except in the most vague sense. For example Horowitz (1976) talks of traumatic material being held in an "active state in memory". He does not explain this statement or the process(es) that determine how information is encoded, stored and retrieved from this structure. Foa et al (1989) and

Creamer et al (1992) utilise semantic memory networks to explain the encoding, storage and retrieval of traumatic material, however as Teasdale (1993) has pointed out "propositional" semantic memory networks have problems explaining the experience of emotion in an individual. Teasdale argues that the activation of an implicational level of meaning is responsible for affect-related biases in information processing observed in PTSD. In the case of PTSD this means that in therapy not only must the specific information conveyed by the traumatic event be altered (i.e. the stimulus-response meanings) but also the meanings involved in constructing that memory or thought (implicational meanings). Jones and Barlow (1990) take a different but related view of PTSD. They argue that ruminating about the potential threat in situations (anxious apprehension and attentional narrowing) is a necessary condition for the development of PTSD. The work by Wegner (1994) gives us a way to perceive how cognitive processing factors are involved in increasing intrusive episodes in PTSD. If intrusions are perceived as 'wrong' or inconsistent with the goals of the individual, then an attempt to avoid or suppress intrusions could lead to an increase in the overall level of intrusions.

By looking at the processes of encoding, retrieval and storage of autobiographical memories, by considering the structures and systems that allows knowledge to interact with 'the self' to produce motivations and behavioural intentions, by describing how beliefs and goals interact with knowledge of events to produce "memories", then we may be able to better understand the processes involved in post-traumatic stress reactions. All of the components of information processing: cognitive capacity, attention, automatic and controlled information processing, and information assimilation are dependant on, and are part of, autobiographical memory processes.

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CHAPTER THREE

AUTOBIOGRAPHICAL MEMORIES, AUTOBIOGRAPHICAL KNOWLEDGE, AND THE PROCESSING OF TRAUMA

Introduction

A major contention of this work is that the processes and structures involved in encoding, storing, and retrieving information from traumatic events is at least partially responsible for the development and maintenance of PTSD. As already argued this necessitates a closer look at autobiographical memory. In order to place memory for traumatic experiences within a more general framework, it is necessary to first consider how memories for events differ from other forms of knowledge. Autobiographical memories can be conceived as a form of knowledge that *shares* some characteristics with other forms of knowledge but that it is the *pattern* of these characteristics and not any single defining characteristic that makes up what we call autobiographical memory (Conway, 1990). It is proposed here that motivations, emotions, and self-concepts are used to encode, store and retrieve information from events and are central to the processing of self-relevant events such as traumatic experiences. This chapter considers the findings of research and theory into the structure and organisation of autobiographical memory and begins to investigate how these factors are represented in PTSD.

Distinguishing Autobiographical Memory From Other Forms of Knowledge

There a number of different kinds of knowledge that we use in day to day existence, and which we would be unable to function without, namely: procedural, semantic and episodic memory.

Procedural memories are thought to represent information that is used in fairly automatic behaviours. They are not normally available to consciousness, although they must have been at some time in order for skills to have been learned. Once learnt they are hard to forget or modify. Procedural memories include skills such as whistling and riding a bike.

Semantic memories on the other hand, are concerned with knowledge about states of the world which appear in the form of declarations (Tulving, 1983, 1985). Semantic memories are represented as propositions such as "canaries have wings", and they give us information about the relationships between objects. Unlike procedural memories they are available to consciousness and are thus easily modified. However, neither semantic nor procedural knowledge has to be 'consciously remembered' in order for us to use it.

The "experience of remembering" appears to be limited to the recall of events and episodes, what Tulving (1972) termed episodic memory. These are situations in which one remembers an experienced event which contains spatio-temporal information (details of time and space) (Conway, 1990). Like semantic memory, episodic memory contains information about (past) states of the world, which are consciously available and modifiable. However, episodic memories are context bound, refer to times and places, and are directly involved in the experience of remembering. Semantic memories on the other hand are context-free, the information is not normally linked to time and places and the access of such memories does not normally involve the experience of remembering.

Episodic memories are normally induced in experimental situations. The content of episodic memories is controlled in order to prevent meaningful processing of information. By its very nature it removes the subjects ability to interpret the event. Thus the experimenter is only ever examining a particular feature of memory for events, while autobiographical memory involves remembering a number of characteristics over a number of different situations, all of which differ from those found in laboratory settings. Conway (1990) has proposed that episodic memory be considered a form of autobiographical memory, or, *the study of specific events which have been extensively controlled.*

A further problem in defining autobiographical memory involves the nature of autobiographical knowledge. While semantic and episodic memory are quite distinct from each other the same cannot be said for semantic and autobiographical memory. Some autobiographical memories can be recalled in the absence of any imaginal representation. For example, if asked the question "Do you own a house?", you may be able to answer without calling any specific memory to mind. Obviously this is a form of autobiographical knowledge - even though no image is recalled. Thus some (but not all) autobiographical memories involve semantic knowledge (factual autobiographical knowledge; Conway, 1987), while episodic memories clearly do not.

Furthermore, unlike episodic memories, memories for specific experiences include an *interpretation* of the event, they can cover extended periods of time, and recollection of this knowledge is often months and years after the episodes occurred, and not minutes, hours and days after it.

Thus with episodic memories the micro-details of an event will be recalled, isolated and without any meaning attached. With autobiographical memories a much wider range of details may be remembered, often with the subjects interpretation of meaning, sometimes with accompanying imagery,

all of which may be recalled over the long term. Such differences have led only the latter form of knowledge to be termed autobiographical memory (Conway, 1992).

Types of Autobiographical Memory

Brewer (1986) classified memories in terms of *self-reference*, proposing that this is what makes autobiographical memories distinctive from other forms of memory. Self-referenced memories can be divided into image and non-image based memories of single or repeated events. Brewer defines autobiographical memories as the memory of the knowledge of an event which relates to the self. He admits that without a definition of the self this classification becomes redundant, therefore he supplies the following "...*the self is composed of an experiencing ego, a self-schema, and an associated set of personal memories and autobiographical facts*" (Brewer, 1986: pg27). He sees the ego as a conscious experiencing entity that is the focus of our phenomenal experience in day to day life. The term autobiographical memory refers then to the memory of the moment-to-moment experiences of the ego.

A self-schema is described by Brewer as a cognitive structure which contains generic information about the self and its place in the world. This knowledge is believed to be organised into unconscious mental structures which interact with and filter incoming information. In this way it gives people generic (semantic) knowledge about our goals, beliefs and attitudes. Because of its complex nature it allows a consistency to the self over time, but, because of this complexity it probably changes very slowly.

The classification system that follows from this is based on three factors: the presence of ego-self involvement, whether the experience occurred once or repeatedly, and whether the memory is image-based or not. Thus a *personal memory* is an image-based representation of a single experienced event. An *autobiographical fact* is a non-image based recollection of an

event that has occurred once only. A *generic personal memory* involves recalling an image of an event that occurred repeatedly. Generic personal memories are usually more abstract in form than that of a personal memory because they are assumed to contain the general features from a number of similar events. Lastly, a *self-schema* is a non-imaginal generic memory, and presumably represents highly abstracted personal knowledge taken from repeated experiences.

Brewer's classification system helps differentiate autobiographical and episodic memory to the extent that episodic memories will not contain much ego-self involvement. Put simpler, with episodic memory the complex knowledge structures relating to the self do not come to bear on information encoded from events and retrieved from memory.

However, there are problems with Brewer's conclusions. As Conway (1990) points out it may be the *cue* used to recall an event that determines the form the memory takes. Thus, whether one recalls an autobiographical fact or a personal memory may have less to do with the underlying nature of autobiographical memories than it does with the processes involved accessing them to consciousness. Brewer's classification system does however help define autobiographical knowledge from other forms of knowledge via self-reference.

Autobiographical Memory, Meaning Structures, and Mental Representations

The question is posed how can Autobiographical memories, as defined above, be conceived to relate to other forms of memory and other systems in the mind, and how do these structures and processes interact in information processing. Lundh (1995) has proposed a model of how the systems and processes involved in cognition and memory are related, and how they interact to produce cognitive experience in humans. Lundh's model can

help us to conceive of the relation between autobiographical memory and the processing of information from traumatic events.

He refers to Meaning Structures (MS) which are cognitive-evaluational structures in a persons mind/brain that develop in order for people to make sense of their experiences of objects and events. Meaning structures are responsible for categorising information and for forming memory networks (although they are not memory networks in and of themselves). In this way they can be seen as responsible for imparting implicational meanings to events (Teasdale, 1993). Meaning structures have two functions, they serve as knowledge (beliefs and expectations) about reality, and secondly they generate a number of emotional and motivational processes such as ambitions, goals, values, attitudes, appraisals, and desires. It is this first aspect of meaning structures that has received the most attention by cognitive theorists while the second function of MS has tended to be ignored. However as Lundh (1995) argues, human knowledge and beliefs are inseparable from emotional and motivational factors.

When meaning structures interact with peripheral subsystems in the mind (verbal, perceptual, and behavioural) they produce mental representations. Mental representations are that part of mental processes that involve thinking or imagining about things that are not externally present to our senses. Mental representations can be thought of as the medium of mental activity (Lundh, 1995), because, it is only when information is recalled from long-term memory into short-term or working memory that this information can be manipulated to produce cognitive experiences such as the experience of memories.

Lundh takes an evolutionary and developmental perspective on how meaning structures develop. He argues that meaning structures are the result of genetic predisposition's and individual experience. These cognitive-evaluational structures developed in order for people to make sense of their

experiences of objects and events. From the moment that organisms are born they will make meaningful searches of their environment in order to be able to recognise and approach things that possess value for them and avoid things that possess threat for them.

Lundh argues that networks of memory structures developed and built up around biologically derived values (positive and negative). Among the meaning structures that develop around basic values are those that make it possible for an organism to *predict* and *control* the attainment of positively valued events and the avoidance of negatively valued events. Classical and operant conditioning are two ways in which these structures can develop. Classical (S-S) and operant (S-R-S) conditioning lead to the development of structures where *expectations* are important. Classical conditioning makes the world more predictable and operant conditioning makes the world more predictable and more controllable, because it teaches one that acting in a certain way will increase the probability of experiencing positive events and decreases the probability of experiencing negative events.

Operant and classical conditioning depend on perception and behaviour but not on the existence of language. Thus pre-verbal learning will still result in network formation, but the meanings (threat and value) of events and objects are connected via the perceptual and behavioural systems to classes of stimuli and responses (See Figure One).

With the acquisition of language a third system (the verbal system) develops. This third system reorganises already existing meaning structures and will result in new kinds of inter-connections among the nodes in the network. The pre-existing classes of objects, actions and events acquire links to word nodes. This results in some of the former connections between stimuli and responses acquiring links to verbal nodes as well as perceptual nodes. It also results in the "verbal system", that part of the mind that is

involved in producing and comprehending speech and written language, and in verbal and conceptual thinking about events and objects.

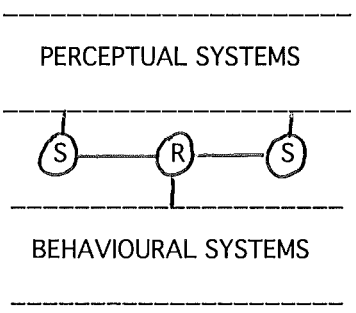

FIGURE 1. An Elementary Meaning Structure. This structure involves the expectations that if (S) occurs then (R) is likely to lead to (S). The shading of S means that it is invested with Value (Lundh, 1995. pg.370.)

Meaning Structures and Mental Processes

Lundh argues that mental processes involve the interaction of the CNMS (central network of meaning structures) and peripheral subsystems (behavioural, perceptual, and verbal). Storage of long-term information occurs in the CNMS, while encoding and retrieval of information occurs through interactions between the CNMS and the other systems. In the short-term, information is recalled from the CNMS and held in working memory through various memory codes. This enables people to apply various cognitive processes to this information and this allows the processing of information to occur.

Lundh argues that the information stored in long term memory is made up of the meaningful interpretations of perceptual and verbal experiences. This means that information, encoded into and recalled from long-term memory, will always contain an evaluation or interpretation of a situation or event which originates from meaning structures. This evaluation will be related to factors such as the importance of the event for the self, and in

what way the event is/was related to goals for that individual. This is a higher level of meaning, or what Teasdale (1993) refers to as implicational meaning.

Memory and Meaning Structures

Lundh's is a dual-processing theory. It argues that there are two ways in which information from the environment and long-term memory is processed but that there is only one storage unit for this information (the CNMS). This differs from the work of Pavio (1971, 1986) who argues for two different long-term memory systems, the "imaginal" and the "verbal" code. However Pavio's theory cannot explain how we know (or relate in memory) that a verbal description and an image of an object refer to the same thing. The case for a dual processing system has been demonstrated in a number of studies but the evidence for duel storage systems is less sound (Marschank, Richman, Yuille, & Hunt, 1987; Marschank, & Surian, 1989). In fact dual coding of information may be a process distinction at the level of working memory (Lundh, 1995).

Meaning structures will hold our episodic, semantic, procedural, perceptual and autobiographical memory. Lundh suggests that these forms of memory are differentiated by encoding and retrieval processes, but that they are stored in the same system in long-term memory, the CNMS (See Figure 2).

SEMANTIC AND PERCEPTUAL MEMORY

According to Lundh's theory semantic memory involves external stimuli entering the senses through the verbal system. Retrieving this information involves accessing information about events or objects from the CNMS, through the verbal system, in the form of thoughts. Perceptual memory involves the same process but encoding and retrieving information

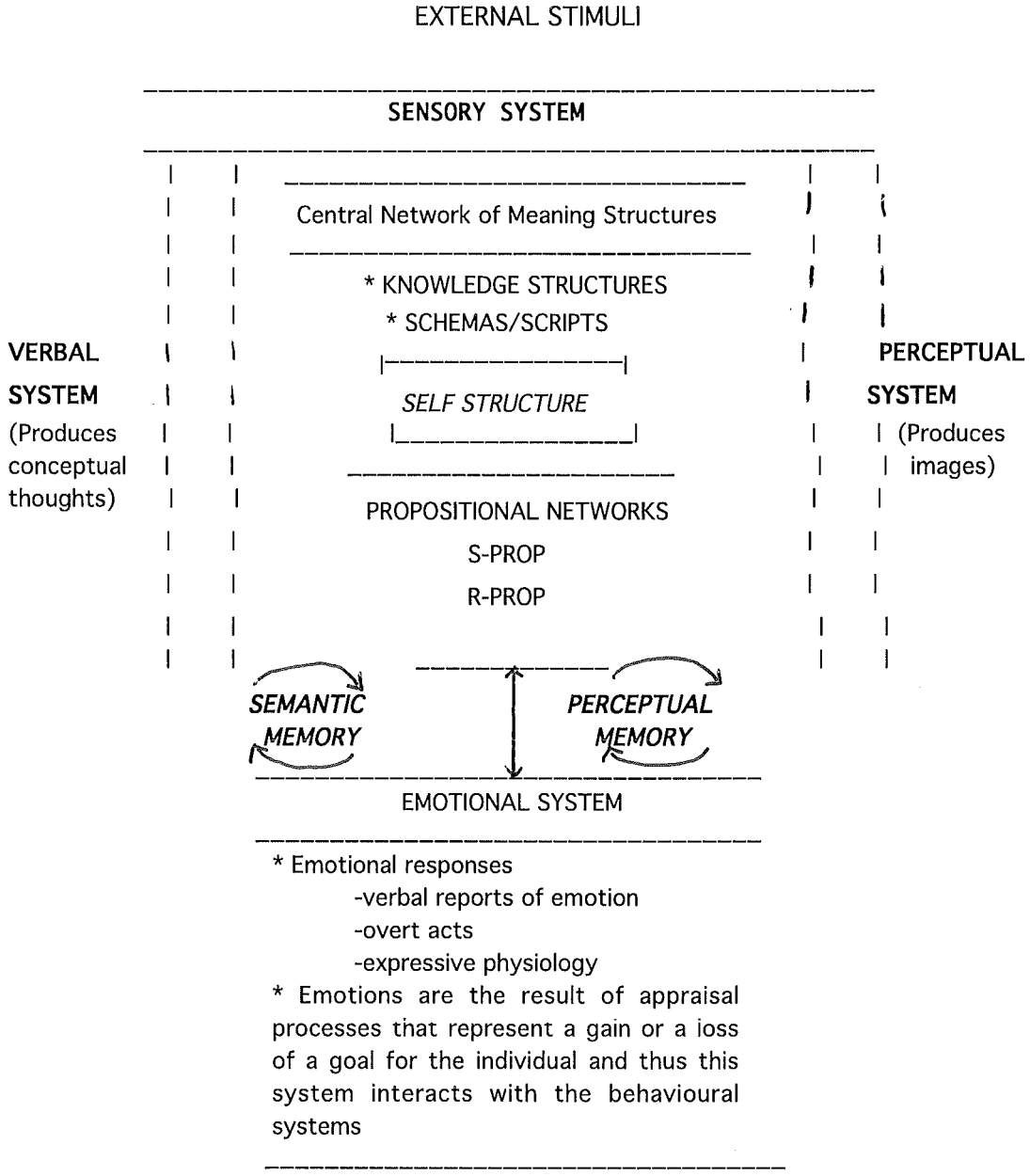

FIGURE 2. A Schematic representation of the dual-coding theory of memory as proposed by Lundh (1995). Semantic and Perceptual memory function as loops where external stimuli that enters the senses is encoded and retrieved from the CNMS via the perceptual/imaginal and verbal systems (represented by two-way arrows). Episodic memory involves retrieval of information from both of these systems related to specific, concrete events. Application of self-knowledge from the CNMS to information accessed from memory networks results in Autobiographical Memory, also retrieved and encoded via perceptual and verbal systems. Two-way arrow from emotional system to CNMS indicates that these two systems can effect and initiate each other.

from the CNMS occurs through the perceptual subsystem in the form of images (See Figure Two). Because all information is stored in the same unit, people are able to tell that an image and a verbal report of an object refer to the same external stimulus. When the central network of meaning structures is activated by a perceptual or verbal cue the whole meaning structure is accessed and the knowledge of an event can be retrieved as either a thought or an image. According to Lundh's model it will not matter whether information is accessed from the central network of meaning structures via sensory or perceptual pathways because both forms of processing access the same knowledge pool (the CNMS). Thus the meaning accessed will be relatively independent of the information channel used.

Researchers have found that pictures are more likely to be remembered than concrete words, and concrete words are more likely to be remembered than abstract words. Lundh believes that *imagery improves memory* because it results in the elaboration of the information which is input. This increases its relatedness to other information in the CNMS and improves the distinctiveness of the resultant memory trace. Events that are encoded via both perceptual and verbal pathways will presumably be easier to access because more stimuli (memory cues) will be able to activate the memory network.

PROCEDURAL MEMORY AND BEHAVIOURAL SYSTEMS

It is part of the essential nature of meaning structures that they are connected to behavioural (motivational) systems. Without a record of what the environment affords meaning would have no purpose. It is impossible to value something if we do not know that certain behavioural reactions will result in desirable and/or undesirable outcomes. Thus meaning structures are connected to the environment through behavioural systems. Knowing what the outcome of an interaction with the environment will be will depend

on an individuals behavioural repertoires, which will in themselves depend on personal learning experiences.

Therefore Lundh (1995) argues for hierarchically organised behavioural systems that make use of information held in the CNMS, and that specify at the highest level the goal of a behaviour, and at lower levels the detailed movements needed to achieve this goal. The purpose of behavioural systems, along with procedural memory, life plans, long-term goals and values are to *motivate* individuals. The behavioural systems act then as a third link between the CNMS and the external world.

Under Lundh's' model behavioural actions, coping strategies and long-term goals are represented as nodes in the memory networks. These elements have connections to the behavioural systems of various strengths depending on the "value" of the associations (their ability to foster positive events and prevent the experience of negative events). These associations will be strengthened or weakened over time as life goals, and behavioural strategies change, and when new information is assimilated into the meaning structures. As we shall see goals (and thus a behavioural system) play an important role in traumatic memory formation.

EPISODIC MEMORY AND MEANING STRUCTURES

Lundh proposes that experiencing an event (an episode) and encoding it into memory depends on attending to perceptual and verbal stimuli, including thoughts, from the environment. This is presumed to activate the CNMS via both the perceptual/imaginal and verbal systems. In episodic memories this information will be encoded in terms of existing meaning structures, because unlike the generalisation of information that occurs in perceptual and semantic memory, episodic memories will be for a particular concrete (in the temporal sense) episode. Thus episodic memories are indexed by temporal factors including existing cognitive capacities and pre-existing meaning structures.

To Lundh the relationship between meaning structures and episodic memory is circular, in that (1) events are encoded, stored, and retrieved in terms of existing meaning structures, and (2) new meaning structures are developed as the result of generalisation from a sequence of similar events. The encoding, storage and retrieval of episodic memories in terms of existing meaning structures implies that recall is a constructive, elaborative mental activity. Therefore how we remember an event can change over time as our meaning structure changes, as we come to learn new connections between events and consequences, and how these relate to life goals and other motivations.

AUTOBIOGRAPHICAL MEMORY AND MEANING STRUCTURES

According to Brewers (1986) classification system autobiographical memory results from the retrieval of personally significant information. As noted earlier, autobiographical memory is not a separate subsystem or memory structure but rather our memory for events that relate to the self. Information about the self which is applied to our experience of events is assumed to be held in the CNMS along with long-term goals, beliefs and other abstract knowledge about the self as well as goals, beliefs and life-plans (See Figure 2.). It is assumed that this information is applied to the processing of personally significant events. The importance and functioning of these factors in PTSD is related to the organisation and structure of autobiographical knowledge and memory stores.

Specific autobiographical memories are reconstructed from abstract information stored in the CNMS and from the specific details of events. Like episodic memories this information is encoded into memory along current states or values for an individual because the memories are of specific events (in a temporal sense). Thus each time a memory is encoded it is along pre-existing beliefs and "views" of the world and self, that are assumed to be held in self-schemas within meaning structures.

Mental representations of information stored in long-term memory are produced by the spread of activation from the CNMS into the verbal and imaginal subsystems. If this information is selectively attended to it becomes activated at the level of *working memory.* During autobiographical memory recall self-knowledge is applied to this information in order to produce a mental representation. The exact nature of this information might include cognitive components such as (1) goals, ambitions, and ideals; (2) various beliefs about the self; and (3) knowledge about ones own mental processes and memory limitations which serve to regulate mental processes (Lundh, 1995). Thus meaning structures will contain both a cognitive model and a model of the "self" which interact with various cognitive processes and capacities to determine and alter the mental representation that is evoked.

When information is activated into working memory certain operations are able to be applied to this information for a short period of time. These operations are the way in which the content of meaning structures and memory is altered.

Whether one recalls a mental image of a past event or a verbal description of it, the "memory" will contain a certain amount of actual concrete perceptual and verbal information. Some memories will be highly concrete and rich in detail and others will be highly abstract, containing only the meaning of the event. Most memories however will lie along a continuum, somewhere in between these two extremes. What determines whether a memory will be abstract or concrete? This seems to be a function of what factors were attended to when the event occurred, and the level at which they were attended to. Other factors which will interact to produce distinct visual and verbal representations include the emotion present at the time of encoding, with highly emotional events producing vivid memories. Another important factor is that we can consciously shift the level at which we attend to information (Lundh, 1995). The importance of this factor for

information processing has been demonstrated in the work on mental control (Wegner, 1994), and mental contamination (Wilson & Brekke, 1994). In times of stress and high cognitive load such as during traumatic events and during re-experiencing episodes people will shift the level at which they attend to information and this results in skewed memory records of events and acts to perpetuate existing beliefs about the self and the world (See Chapter Two for a fuller description of these factors).

It is important to remember that meaning structures and memory structures are different. Meaning structures are responsible for categorising and organising the kind of information that will be constructed into (and thus able to be retrieved from) memory networks. They do this by utilising information about a persons goals, desires, and beliefs, to evaluate incoming stimuli. Meaning structures are also responsible for processes such as selective attention because they contain information about peoples cognitive resources and abilities. As the research into autobiographical memory will show it is this information that is used to determine what is encoded and retrieved from memory structures.

The question remains how do factors such as emotion, attention, and the self interact to produce specific autobiographical memories such as those experienced in PTSD? Research into the processes of autobiographical memory can help us in this regard.

Emotions, the Self, and Autobiographical Memory

Robinson (1980) conducted several autobiographical memory experiments in which subjects were given cue words which represented different emotions (fear, anger, surprise, happy, etc.). The subjects were required to recall a personal memory of an event in which the emotion of the cue word was present. Robinson recorded retrieval times and a number of other factors such as ratings of intensity and pleasantness of the memory. For example, a subject was given the cue word *happy*, and the time taken to

retrieve the memory was recorded. Fast retrieval times indicate that the memory was highly available to retrieval processes while a slow retrieval time indicates that the memory was less available.

In these experiments Robinson found that *intense emotions* increased the availability of an autobiographical memory regardless of how pleasant or unpleasant the memory was to the subject. Robinson attributes this to the amount of attention and processing that intense emotions provoke towards accompanying events. It is also possible that these emotionally intense memories receive more *rehearsal* which makes them more available. I propose that these factors are important because they are indications that goals or motives for an individual are used in representing emotionally-charged events in memory.

The question remains, how do these factors (attention and rehearsal) make a memory more available? Work by Pillemer, Goldsmith, Panter, & White (1988) suggests that first time or personally relevant experiences are preserved in memory while subsequent similar events, which are unmemorable because they are not novel (or perhaps because they do not represent current concerns for the individual), merge into schematic representation. They found that the two best predictors for the clarity of memories were the intensity of emotion at the time of experience and *perceived life impact* at the time of experience. The clarity of the memories in such cases may be related to some form of privileged encoding of first time experiences. If meaning structures are organised to encode memories of first time experiences as the basis for more complex schematic representations in memory then these first time experiences would be expected to receive greater processing.

This leaves us with the question, Why is emotion correlated with memory clarity and why does "experienced emotion" affect memory in such a fashion? It was suggested by Conway (1990) that emotional intensity and

life impact are important because they indicate that *knowledge structures about the self have been used in representing the memory.* A series of experiments by Conway (1989) found that *emotion* and *goal-derived* word categories (indicating current concerns for an individual) produce the highest amount of spontaneous autobiographical memory retrieval, while abstract concepts produce high levels of semantic images. These findings are important because they indicate different processes related to emotion, the self, and motivations are involved in the recall of semantic and autobiographical memory. As Conway (1990) has noted, emotions and the self are critical in determining memory content and the subsequent availability of such memories. Both of these factors, memory content and memory availability, have been implicated in re-experiencing episodes in PTSD (Cassiday et al, 1992; Foa et al, 1991; Zeitlan & McNally, 1991).

Organisation of Autobiographical Memory

Autobiographical memories constitute knowledge about events that are self-relevant. Lundh's theory of meaning structures and mental representations helps to conceptualise how the general knowledge from personally-relevant events is related to other forms of knowledge in cognitive structures, and how these structures act to organise information from the environment. What remains is to define how specific memories of events are organised in memory and how these memories function in traumatic experiences.

STORAGE OF AUTOBIOGRAPHICAL KNOWLEDGE

Work into the organisation of Autobiographical memory has found that the memories of general events may be organised in long term memory in the form of lifetime periods and represented by "thematic" knowledge abstracted from a set of associated events (Robinson, 1992). This thematic knowledge is assumed to be organised around specific memories which are

related to experiences which convey information abut the attainment or loss of goals of the self. As already noted first-time experiences often act in this way because they convey information about the attainment or loss of personally significant goals or beliefs (Robinson, 1992).

Anderson and Conway (1993) studied the organisation of general memory for specific episodes, and they propose that autobiographical knowledge is hierarchically organised. They found that while the details of specific events may be organised in memory in a forward temporal order (the manner in which they were encoded), they are accessed via thematic knowledge structures that are themselves organised into the distinctive details of events. Thus an individuals life themes will access memories of general events that give them information about these themes, and these general events index the specific details of a particular event. These general events can be composed of a set of associated events or a single event that relates to a particular theme.

The individual memories of events that are retained in memory tend to convey information about goal-attainment (positive and negative) that is significant for the self (such as success or failure to perform as expected in a situation)(Conway, 1995). Such expectancy-consistent information processing may also be responsible for increasing or decreasing the likelihood of developing PTSD and is indexed by automatic information processing such as an inability to suppress unwanted thoughts and images (intrusions).

Robinson (1992) has suggested that memories of first-time experiences form a particular category of general events that are important in determining the self because they convey information about success or failure that is likely to affect performance in other similar events in the future and because future similar experiences will be indexed under the same theme in memory. It is this information that will be used to evaluate performance in similar

situations in the future. It follows from this that specific memories held in long-term memory gives us information that can be used to avoid or predict success and failure (to attain positively valued experiences and avoid negatively valued experiences) in the future. In PTSD the traumatic event or events will be organised into a thematic structure that represents novel *or* personally significant information about the attainment or loss of a goal in that situation.

The specific details of autobiographical memory are termed event specific knowledge (ESK) and they are assumed to be represented in memory at the lowest level. It has even been proposed that event specific knowledge may be represented in a separate memory store from general and thematic knowledge (Conway, 1995). It has also been proposed that thematic knowledge forms part of a general all-purpose memory structure (a meaning structure) that is used for various cognitive processes where general information about the self is required (Anderson and Conway, 1993). In this way thematic and general information about a persons past experiences with fearful situations will be represented in meaning structures. Such information about past selves held in an abstract form in meaning structures will be able to be used to "customise" other knowledge, in particular semantic knowledge (Conway, 1990). It is this information which is used to categorise information from events and is responsible for skewing a memory network towards threat. We can only encode into memory what we attended to in the first place. In stressful situations people attend to those factors related to goal-states. Thus the content of a memory is dependent on the information used to interpret the situation. Perceiving a situation as threatening involves activating perceptions of threat held in meaning structures.

If thematic and general autobiographical knowledge forms a separate memory store from ESK then this can help to explain the retrieval of

overgeneral memory in PTSD patients for all events except the traumatic ones. Overgeneral memory occurs when subjects are required to recall a specific memory to a cue word. If they recall a general event instead of a specific event then they are said to have overgeneral memory. In PTSD patients overgeneral memory has been observed for personal information not related to the trauma (McNally et al, 1994). If the general and thematic knowledge of these events is held in a separate pool from ESK and thematic knowledge is able to be accessed, but recall or access of the ESK pool is prevented by some means, then only general events will be able to be recalled and not the specific details of these events. We shall investigate in the next section attentional factors that could be responsible for overgeneral memory.

When the micro-details of events are recalled they tend to be associated with sensory information, vivid images, affect, and sometimes a distinctive "fact". While the existence of a separate memory store for ESK is still unproved, it does concur with findings from implicit memory research that indicates that the event specific knowledge of events may be related to pre-semantic perceptual memory systems like those proposed by Lundh (1995) (Tulving & Schacter, 1990). It has been shown that implicit memory (a form of automatic information processing) of highly specific sensory knowledge can be retained, and, can influence subsequent behaviour (Schacter, 1987). Thus traumatic information, for example, in the form of specific sensory knowledge can influence behaviour without having to be consciously recalled from long-term memory. Presumably it acts to filter what information is encoded from the environment by priming cognitive states of arousal that act to focus attention in stressful situations in order to encode into memory those facets of the situation that convey information that is consistent with goals or life-plans. In the case of traumatic events this is likely to be information about the presence and nature of threat.

LIFE THEMES AND ENCODING AND RETRIEVAL FACTORS

Life themes (which are responsible for accessing more specific autobiographical memories) are related to the self and influence and are partially responsible for the occurrence of emotions.

One view on how these themes arise comes from Conway (1992) who proposes that at any one time we are motivated by a set of plans which reflect current concerns for the individual. Themes emerge from disparities between current self concepts and some desired or feared self (Higgins, 1987). This self-system is responsible for imparting meaning to events and thus produces emotional reactions to the perceived impact of life events. According to this theory emotions occur at the places where goals are achieved or frustrated. This necessitates the access of abstract (life-goal) information about the self, or as Teasdale (1993) conceives of it implicational levels of meaning, in order to produce emotions to events or the memories of events.

Lazarus (1991) proposes that emotions are the result of appraisals of situations that indicate the frustration or attainment of goals. Appraisal involves evaluating the personal significance of an encounter with the environment. He proposes that different emotions are generated by specific patterns of appraisal. Our display of an emotion will depend on the meaning that we derive from a situation and different emotions will prime or initiate specific action plans to deal with that state. We have pre-emotion (sensory) states in which we *perceive* situations as threatening or beneficial. It is only after this appraisal process has occurred that an emotion is evoked. Thus when we perceive a situation as personally significant (because it indicates that a self-goal has been achieved or thwarted) then an emotional experience to that object or event will occur.

However, a theory that emotions result from appraisals of situations necessitates the proposal of a plan or action sequence for the individual. Without knowing what we expect to normally happen in a situation we cannot know that a goal has been thwarted or achieved. Oatley (1992) has proposed a plan based theory of emotion that posits that specific plans in situations consist of a goal (or goals), a set of preconditions for activating the goal, a set of actions for when goals are met or frustrated, and a set of effects. According to Lundh (1995) these behavioural plans make use of information in the CNMS and are organised hierarchically. Under Oatley's theory when an emotion occurs it represents to the individual a need to re-evaluate plans and the action plan is responsible for initiating alternative strategies to meet current goals.

In a personally significant event self-discrepancies (or themes) will determine what information is encoded, and when current self-discrepancies are no longer active these experiences will be represented by the memories of these events (Conway, 1995). Thus the cues that elicit the most memories from a life period will be the ones that access former self-discrepancies for that individual.

One might argue that memory networks contain nodes for the *perception* of emotions but that the emotions themselves result from the application of motivational information and higher level meanings (Teasdale, 1993). Thus a memory of a traumatic experience will only develop into a fear memory network after the situation referenced by the memory is perceived to be threatening (in that it has thwarted a goal or plan for the individual). This could occur immediately after the traumatic event or some time later, but it will always be dependant on a perception of threat resulting from the frustration or threat of a life-goal. This life-goal could be related to individual survival or some other factor such as ones belief in their competence on stressful situations.

Lazarus (1991) argues that the direction of the behavioural flow between cognition and emotion goes both ways. Thus while emotion is a response to meaning, it can also produce or influence subsequent thoughts and emotions. So, while fear will result from the application of abstract information about the self and the world to a situation, it will also result in the activation of cognition's (images and thoughts) related to that fear. While automatic thoughts will activate fear, fear activates and acts to maintain negative thoughts by activating traumatic memory structures. This cycle of information processing "proves" to the individual that negative thoughts are correct, even though they are based on a biased perception of a situation. A person is unable to perceive their thinking as biased because information from situations is automatically processed using information contained in meaning structures which is unconscious and thus not usually subject to evaluation.

Life themes develop in response to existential problems for the individual (Conway, 1995). The importance of earlier themes (and thus memories) in later life depends upon how problems and solutions are conceptualised, because this conceptualisation remains in memory and can effect behaviour in later life (Conway, 1995). Life-themes occur in traumatised and non-traumatised individuals and will be related to the current concerns for that individual at the time of encoding (Reimann & McNally, 1995).

When faced with a life problem, in instances of goal frustration, (termed a lifetime period-specific problem, Cantor & Kihlstrom, 1985) a person will selectively allocate resources. When faced with a number of competing goals (in periods of transition or high stress) people allocate problem-solving resources. People do this, according to Markus & Nurius (1986), because they are attempting to attain a number of "possible selves", and this is achieved through developing and applying behaviour-oriented plans that contain sub-goal structures. It is through this network of currently active

themes of the self that knowledge of specific events are encoded. This forms the thematic structure of the autobiographical memory (knowledge) base. Thus autobiographical memories of traumatic experiences can be thought of as a record of past selves. The specific verbal and perceptual details of peoples experiences will be represented as specific memories such as those proposed by semantic memory networks. The more abstracted form of this knowledge is held in meaning structures.

Autobiographical Memory and Trauma

Autobiographical memories and thus trauma-related representations are constructed from the autobiographical knowledge base. The research into PTSD and memory indicates that there are cognitive representations of threat in people with PTSD that are chronically accessible. Thus there is a need to investigate how these "memories" are accessed to consciousness and how they result in intrusions.

RETRIEVAL FACTORS

Williams & Hollan (1981) proposed that memories are accessed via a "cyclic" retrieval process. First a cue is elaborated into a memory description. Then this memory description is used to search long-term memory stores. Any and all knowledge accessed by this process is evaluated, and a decision is made on whether to terminate the memory search. Termination of the search will occur when the desired memory is found, but this may take several "cycles" of search and evaluation. A memory is conceived of as all the information accessed from this retrieval process (Collin & Loftus, 1975), and memories often contain themes, general events, and event specific details.

The evaluation stage of the retrieval process acts to maintain and terminate (or inhibit) activation of the memory structure. Norman & Shallice (1980) and Shallice (1988) propose that the S.A.S (supervisory attentional

system) is responsible for this function. The SAS acts to modulate automatic processes involved in memory functioning and is similar to the proposal by Wegner (1994) of "mental control" which is a two-step process that acts to inhibit or suppress unwanted thoughts by searching for and substituting appropriate for inappropriate thoughts. This presumably occurs via a system such as the SAS .

The SAS is assumed to have access to information from the environment and to the cognitive system which includes information about cognitive capabilities and behavioural intentions (See also Lundh (1995) on the cognitive regulatory function of meaning structures, page 55 this work). The SAS would incorporate current self concepts, active themes, and goals and plans of the self. In this way the SAS is able to construct "mental models" of the world that act to constrain memory functioning. The SAS acts to elaborate cues into memory descriptions. It is able to do this because it accesses information related to current self-concepts and goals. With this information it forms a mental model which is used to search the autobiographical knowledge structure. This searching process occurs automatically to access life periods. A spread of activation occurs to progressively more specific details of an event. Because the SAS is accessing information related to current self-concepts and goals it will influence the kind of information that is activated from memory and may also effect the elaboration phase of memory recall (Conway, 1995).

Because self-concepts give meaning to memories when our self-concepts and goals change or when a life-goal is frustrated then the meaningfulness of events related to this goal or self-concept will also change. In this way events that were once considered important will no longer seem so while other events which did not seem important at the time they were encoded will take on new meaning. This statement offers us a way to conceive of delayed reactions in PTSD. As Foa et al (1989)

proposed delayed reactions to trauma develop when memory structures acquire a meaning about the presence of threat in a situation. Foa et al suggest that gaining new information about a traumatic event can result in a delayed reaction. According to this theory such an acquired meaning would involve information about the frustration of a life goal whether it be individual survival or some other goal related to ones view of the self or the world. Only after a goal-state is frustrated or achieved will the memory of an event come to be related to a perception of threat.

There are certain factors which are important in determining the kind of memory that we recall when presented with cues. Because our memories are hierarchically organised (themes - general events - event specific knowledge) once a memory description has accessed a theme then the memories able to be recalled will be limited to events indexed by that theme. Thus if a memory description accesses the 'trauma-related' theme, then recall of memories will be confined to events related to that theme. As well as the cue used to recall a memory, the self-concept and goals that are active at the time of retrieval will determine what information is recalled from memory. Because self-concepts determine memory descriptions and the evaluation stage of memory retrieval, self-concepts will determine memory content. If a person is focused on cues (including emotions) that index or access traumatic memory themes then other memories from other life themes will be difficult to access. In the case of PTSD this may lead to an increase in intrusive material and/or an overgeneral memory for non-traumatic events.

Thus the material recalled from memory after a traumatic event will be the information that is accessed by the cues present in the environment when these cues are elaborated into memory descriptions based on current self-concepts and goals for the individual. In this way retrieval of traumatic material is seen to be modulated by central control processes (Conway,

1995). The pattern of memory activation will be a memory along with the constraints on the memory-retrieval process.

PROCESSING INFORMATION FROM LTM

Memory construction as outlined above makes large demands on processing resources. Conway (1995) proposes that the construction of autobiographical memories occurs "in the background" and that memories will only emerge into conscious awareness when appropriate or when other current cognitive tasks are completed. Thus autobiographical memories may be constantly activated in some form, particularly those memories that relate to current concerns for the individual. In the case of PTSD memories of the traumatic event will become activated *if* they are perceived as important to a goal for the individual. Furthermore they will become chronically activated if the individual is unable to suppress these images or thoughts. In this way a persons perception of threat is a better indicator of whether or not PTSD will develop *because* it is an indication of an active concern or motive. It follows from this that intrusive material would stop, not simply because there is nothing left to learn from the reminders of the event (Epstein, 1990), but because intrusive material no longer represents a persons current concerns. The intrusive memories no longer act to indicate goal-frustration to the individual experiencing them. An implication of this statement is that therapy that serves to change implicational as well as propositional meanings should also result in the extinction of fear and a decrease in intrusive material in PTSD, and may represent a better form of therapy than that which serves to alter only the explicit propositional meanings of the memory network. As long as a person holds negative views of their self and the world that act to construct memories of events in a negative way the reminders of these events will remain as intrusive and maladaptive. Coming to new conclusions about the implications of the

trauma for ones self-concept will decrease the importance of the accompanying memories because they act to disengage those memories from negative goal states whose purpose is to filter and classify information.

ENCODING FACTORS

It may be that the processes involved in retrieval of memories are also involved in the encoding of memories (Conway, 1995). In this way encoding would occur in a cyclic fashion. According to this view the first step in encoding traumatic memories is the access of knowledge from long-term memory in order to make a description of the to-be-encoded event (TBE). The TBE knowledge has to be encoded and assimilated into pre-existing knowledge structures, otherwise it cannot be recalled at a future time. Thus integrating information into long-term memory would be an essential facet of encoding.

Conway (1995) argues that encoding consists of a number of component processes. First the experience is segmented and represented in memory by the general event structure that it represents. Only then is this information (which has already been processed to some extent) integrated with long-term memory stores. A study by Conway, Anderson, Larsen, McDaniel, McClelland, Rawles, and Logie (1994) of flashbulb and nonflashbulb memories has found that factors such as prior knowledge, personal importance, and affect act together in flashbulb memories (highly self-important memories) to rapidly integrate self-relevant events into long-term memory. This makes these events more complete in terms of the details of the events. The integration and consolidation of this information into long-term memory stores will continue after the event terminates.

Accessing this memory structure into working memory will serve to fix the parameters of the memory in long-term memory. In this way information from traumatic events can be said to have been processed before it eventuates in re-experiencing episodes. Intrusive memories in PTSD result

from the chronic activation of this representation from memory in a way that acts to increase the level of intrusions (Wegner, 1995)

Cognitive shortcuts in the form of automatic thoughts which are used to cut down processing requirements in times of high cognitive load (Wilson & Brekke, 1994) will interact with the factors mentioned above to determine what information is encoded from events. This includes selective attention to stimuli in an environment, and selective exposure and selective interpretation of situations and performance. These factors can combine in the encoding of traumatic events to result in biased records of events in an expectancy-consistent fashion.

People often ask why memories of traumatic events are so vivid. In recollecting autobiographical memories the experience of remembering is assumed to arise from the nature of information that is accessed when constructing a memory. Memories will seem more intense and vivid when there is more event specific details about that event present in a memory. The presence of and ability to recall event specific knowledge is dependent on cues held at the general-event level (Conway, 1995). Difficulty in retrieving event specific knowledge for non-traumatic events (overgeneral memory) has been proposed as being related to emotional numbing in PTSD (McNally et al, 1994). Event specific details may give people the feeling that they experienced events rather than simply remembered them (as in when we remember stories about ourselves that were told to us by others)(Conway, 1995). If event specific knowledge cannot be accessed then these generalised memories of non-traumatic experiences will not convey the same kind of information to the self that the experience of remembering does. If you do not feel personally involved in your own memories then your experience of these memories will be emotionally absent or "numb". Consequently the negative memories of the trauma, which are high in sensory detail, will seem more real and the experiences

and beliefs associated with these memories will seem more salient to the self. If the traumatic memory conveys information that one failed to perform as expected or required (goal frustration) then the memories of the trauma will convey negative information about the self and the world. Such meanings and evaluations of behaviour could restrict a persons recall of coping strategies by preventing access to other less-emotionally charged life-periods and the accompanying memories, behaviour strategies and beliefs of the self. This process would perpetuate current negative views of the self and the world.

From the current research and theory into autobiographical memory organisation there appears to be two processes that mediate memory consolidation and integration into LTM. One set of processes help to segment the experience into action sequences and general events on the basis of personally salient event features. The second set of processes act to integrate the general-event structure with knowledge structures in the autobiographical knowledge base. These processes will occur rapidly for events considered personally important. Integration of information into the lifetime period - general event structure outlined earlier occurs slowly.

Because knowledge is only selectively attended to and thus selectively encoded the retrieval of event knowledge will be selective as well. We can only recall the features of events that were encoded in the first place. However, because retrieval of autobiographical memories involves utilising self-concepts and goals, and because memory retrieval is constructive, the meaning present at the time of encoding can be altered at the time of retrieval. In the case of PTSD this can produce delayed reactions to traumatic experiences but it also allows people to consider alternate evaluations of situations.

The question remains how do the memories of traumatic experiences come to be chronically activated in memory. This appears to be related in

part to the organisation of autobiographical memory. Meaning structures which hold abstract information about the self and about cognitive capacities act in times of high stress and emotion to cut down processing requirements. This results in selective attention to variables in traumatic situations and in situations that resemble the traumatic stressor. Perceiving a situation and/or ones reaction to this situation as threatening results in an attempt to avoid or suppress unwanted thoughts, emotions and memories. However as Wegner (1994) has shown in times of high cognitive load suppression of unwanted thoughts is more likely to fail. This results in an increase in intrusive material because the traumatic memories are primed for recall during the first stage of suppression of unwanted thoughts (the monitoring stage). This is a form of automatic information processing that makes the traumatic memory structure chronically accessible.

CONCLUSIONS

PTSD is classified in the DSM-IV as an anxiety disorder and involves the experience of a traumatic, life or self-threatening event. The symptoms of PTSD include re-experiencing the traumatic event, avoiding reminders of the event, emotional numbing, and hyperarousal. Research is beginning to look at the role of memory in the disorder. These studies have been reviewed in Chapter One. The main findings are that PTSD involves an attentional bias to threat-relevant information that may be related to the current concerns (or goals) of the individual. This threat representation interferes with performance on other cognitive tasks, is chronically accessible and is assumed to be responsible for the intrusive episodes observed in PTSD. As well as an attentional bias PTSD is characterised by an overgeneral memory for other non-traumatic memories. Overgeneral memory has been implicated in depression and may result in the emotional numbing observed in PTSD. These studies raise several important questions of a theoretical orientation. First how do the intrusive episodes in PTSD develop and how are they maintained. Secondly what is the role of autobiographical memory (our memory for self-relevant events) in the development and maintenance of PTSD. And thirdly what is the role of motivations and goals in the development and maintenance of PTSD. This study set out to find answers to these questions by evaluating information processing theories of PTSD.

In recent years theorists have focused on information processing variables in the etiology and maintenance of Post-traumatic Stress Disorder. Information processing theorists propose that distortions in the way in which traumatic emotionally-charged information is processed are responsible for the development and maintenance of PTSD. The second chapter of this

thesis evaluated theories of information processing in terms of how they could account for memory variables. The study of information processing theories concludes that while many of the information processing theories of PTSD presented here implicitly rely on concepts related to autobiographical memory they do not explicitly attempt to account for the processes and structures that are responsible for the encoding, storage, and retrieval of traumatic memories except in the most vague sense. For example Horowitz (1976) talks of traumatic material being held in an "active state in memory". He does not explain this statement or the process(es) that determine how information is encoded, stored and retrieved from this structure. Foa et al (1989) and Creamer et al (1992) utilise semantic memory networks to explain the encoding, storage and retrieval of traumatic material, however as Teasdale (1993) has pointed out "propositional" semantic memory networks have a number of problems explaining the relation between emotion and memory networks. Teasdale argues that the activation of an implicational level of meaning is responsible for affect-related biases in information processing observed in PTSD, and not propositional constructs as semantic memory network theories posit. Jones and Barlow (1990) take a different but related view of PTSD. They argue that once a person has experienced a traumatic event ruminating about the potential threat in other similar situations (anxious apprehension and attentional narrowing) is a necessary condition for the development of PTSD. The work by Wegner (1994) into mental control gives us a way to perceive how cognitive processing factors are involved in increasing intrusive episodes in PTSD. If intrusions are perceived as 'wrong' or inconsistent with the goals of the individual, then an attempt to avoid or suppress intrusions could lead to an increase in the overall level of intrusions. The findings by Wilson and Brekke (1994) on the role of mental contamination in information processing were also considered.

It was concluded from this evaluation of theories that in order to explain the role of motivations, self concepts, and emotions in processing the information from traumatic events it is necessary to turn to the work on the research and theory in Autobiographical memory. It was contended that a theory of PTSD based on information processing variables needs to explain or at the very least take into consideration the encoding, storage, and retrieval of traumatic information in memory and to consider how this information interacts with other factors such as motivations, emotions and self-concepts to produce these memory records and presumably the symptoms of PTSD.

A summary of the research and findings of the work into Autobiographical Memory and its relation to PTSD considered in Chapter Three is presented below. Autobiographical memory is considered a form (but not a separate form) of memory, and has been termed by Brewer (1986) as *the memory for the knowledge of an event that relates to the self.* Work by Lundh (1995) into the structure of cognitive processes in humans shows that Autobiographical memories along with other forms of memory are dependant on information held in an abstract form in meaning structures, and on the specific details of events held in memory networks. According to Lundh's theory information about traumatic events enters the senses via the perceptual and verbal subsystems into the central network of meaning structures (CNMS)(Lundh, 1995). It is then that various processes are carried out on this information in order for it to be encoded into long-term memory. Encoding occurs when information from the environment is attended to at the level of working memory. Stimuli will be attended to if the accompanying event represents information to the self about the attainment or loss of a goal. Information contained in meaning structures which is used in the process of encoding includes information about the self, information about the goals and beliefs of the individual, and information about the

cognitive capacities of the individual which serve to regulate information processing. This information is utilised by a system such as the S.A.S (supervisory attentional system) (Norman and Shallice, 1980; Shallice, 1988) in order to break down the event and represent it in long-term memory. Events are segmented and represented in memory by the general event structure that they represent. Affecting this process to determine the kind of information that is encoded from events are factors such as the emotional content of the event, and how the event relates to the current goals and beliefs of the individual. Work by Wilson and Brekke (1994) has shown that under stress and high cognitive load automatic information assimilation processes come into force that encode the cues from events which are consistent with the individuals expectations and pre-existing beliefs to the detriment of other cues. Information about events held at the general event level are then integrated and consolidated into long-term memory stores (Conway, 1995).

This process results in a "memory" of the traumatic event which is skewed in an expectancy-consistent manner (Creamer, 1993). This biased record of the event will contain information relating to the self, one's behaviour in that situation and an interpretation or evaluation of these factors. The evaluation of an event arises from information contained in meaning structures (implicational meanings, Teasdale, 1993) and applied to the event during the encoding stage of memory formation.

This representation of the traumatic event is retained in memory under whatever theme it represents to the individual (Conway, 1992). The memory of the event will be positive if it confirms beliefs about the world and the self that are favourable to desired goals or it will be negative if it confirms unfavourable views of the self and the world. It will also be negative if it disconfirms previously held beliefs about the world and/or the self that were favourable to the goals of that individual.

Retrieval of traumatic material is also the responsibility of the S.A.S (Williams & Hollan, 1981). When presented with a cue from the environment, the S.A.S uses information contained in meaning structures to construct a mental representation of the traumatic event. This mental representation is the result of an elaboration of a cue into a memory description. Evaluation of memories and termination of the memory search are also the responsibility of the S.A.S. This process occurs automatically to retrieve thoughts and images of a personal nature.

Teasdale (1993) noted that there are two kinds of information processing; automatic and controlled information processing. Because information from a traumatic event is selectively attended to and thus selectively encoded, retrieval of this material is selective as well. This enables the meaning of an event to change. Because memory retrieval is constructive, the meaning present at the time of encoding can be altered at the time of retrieval if the individual is presented with new information about the event that relates to goals for that individual, or if an individuals goals and/or beliefs change.

In the case of intrusive episodes in PTSD when the intrusions and associated emotional reactions begin (they indicate to the individual the frustration of a goal and the need to re-evaluate the situation) some people will employ avoidance reactions. Using avoidance strategies will be more likely if these strategies have been used in the past because they are more likely to be accessed via the process of mental contamination (Wilson & Brekke, 1994).

By attempting to control or avoid re-experiencing, PTSD sufferers may actually be priming recall of this negatively biased information. Once avoidance begins to be used as a coping strategy for reducing intrusive material a feedback loop is created where narrowing of attention to facets of situations that indicate threat combines with hyperarousal to activate the

S.A.S (or some similar system). This system acts to identify unwanted thoughts and to substitute them with more appropriate goal-consistent thoughts or images. If the substitution phase of mental control fails then these primed unwanted "memories" which have been accessed from long-term into working memory are more likely to accessed to consciousness (Wegner, 1994).

A factor which would contribute to make the failure of suppression more likely is the inability to access other non-traumatic representations from memory. The studies of overgeneral memory in PTSD patients indicate that once a person is exposed to disorder-specific information non-traumatic memories are harder to access (McNally et al, 1994). Because of the organisation of Autobiographical Memory (Conway, 1995), once a life theme has been accessed, recall of memories is limited to events that are indexed by that life theme. Thus once a memory cue is elaborated into a memory description by the S.A.S (in terms of a fearful situation the memory cue would be related in some way to the traumatic event) recall of non-traumatic memories to working memory is less likely. This "cycle" of information processing is likely to prevent recall of alternative coping strategies and other information about performance that non-traumatic autobiographical memories contain. An inability to recall the specific details of these memories makes them seem less real to the self and less salient to the situation one is confronted with (Conway, 1995). With only the information contained in biased memory records with which to judge situations and with only the coping strategies used in this situation with which to act, behaviour will seem stereotyped and emotional reactions towards non-traumatic memories of events may appear numbed or absent.

It was not the aim of this thesis to try to explain all facets of PTSD as a disorder according to the role of memory, emotion, the self, and/or individual motives. Rather it was an attempt to highlight the importance of

Autobiographical memory processes for information processing theories of PTSD. A major problem for theory in this area is that at the present relatively little is known about the functioning of autobiographical memory and even less is known about the role of motives, emotions, and the self in these processes. Despite the lack of knowledge in this area the importance of Autobiographical memory features for determining information processing in PTSD is undeniable. In particular the role of motives, emotions, and behavioural subsystems in traumatic memory formation needs to be addressed by research. At present the link between these variables is at best theoretical as the research in Chapter One indicates.

The work presented here would suggest a move away from the sole use of network theories to explain the processing of information in PTSD. The use of Teasdale's (1993) work and the work of Lundh (1995) indicates that while schema theories and representational theories of the mind are important in processing factors, there is also a need to emphasise the evaluational aspects of memory formation (higher level implicational meanings) which are used to filter experiences. As long as these negative implicational evaluations remain, they will be accessed in times of high stress to prime negative memory networks. Research and therapy must address the role of implicational meanings in forming intrusions in PTSD as well as the propositional relations of memory networks. Likewise there appears to be a need to apply appraisal theories of emotion (such as Lazarus, 1991) to PTSD in order to account for the role of motives in the encoding, storage, and retrieval of traumatic memories. By applying the research and theory of memory to PTSD a better understanding of the symptoms, the development and the maintenance of PTSD is possible.

REFERENCES

American Psychiatric Association (1980). *Diagnostic and statistical manual of mental disorders, (3rd ed.).* Washington, DC: Author.

American Psychiatric Association (1987). *Diagnostic and statistical manual of mental disorders, (3rd ed., rev.)* Washington, DC: Author.

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders, (4th ed.)* Washington, DC: Author.

Anderson, S.J., & Conway, M.A. (1993). Investigating the structure of specific autobiographical memories. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 19, (5),* 1-19.

Barlow, D.H. (1988). *Anxiety and its disorders: The nature and treatment of anxiety and panic.* New York: Guilford.

Blanchard, E.B., Kolb, L.C., Gerardi, R.J., Ryan, P., & Pallmeyer, T.P. (1986). Cardiac response to relevant stimuli as a tool for diagnosing post-traumatic stress disorder in Vietnam veterans. *Behavior Therapy, 17,* 592-606.

Blanchard, E.B., Kolb, L.C., Pallmeyer, T.P., & Gerardi, R.J. (1982). A psychophysiological study of posttraumatic stress disorder in Vietnam veterans. *Psychiatric Quarterly, 54,* 220-229.

Bower, G.H. (1981). Mood and memory. *American Psychologist, 36,* 129-148.

Brewer, W.F. (1986), 'What is autobiographical memory?' In Rubin, D.C. (Ed.). *Autobiographical memory.* Cambridge University Press.

Burgess, A.W., & Holstrom, E. (1979). Adaptive strategies in recovering from rape. *American Journal of Psychiatry, 136,* 1278-1282.

Butler, G., & Mathews, A. (1983). Cognitive processes in anxiety. *Advances in Behavior Research and Therapy, 5,* 51-62.

Cantor, N., & Kihlstrom, J.F. (1985). Social intelligence: The cognitive basis of personality. In P. Shaver (Ed.)., *Self, situations, and social behaviour: Review of personality and social psychology,* (Vol. 6 pp15-34). Beverly Hills, CA:Sage.

Cassiday, K.L., McNally, R.J., & Zeitlan, S.B. (1992). Cognitive processing of trauma cues in rape victims with post-traumatic stress disorder. *Cognitive Therapy and Research, 16, (3),* 283-295.

Collins, A.M., & Loftus, E.F. (1975). A spreading activation theory of semantic processing. *Psychological Review, 82,* 213-234.

Conway, M.A. (1987). Verifying autobiographical facts. *Cognition, 25,* 213-234.

Conway, M.A. (1989). Conceptual representations of emotions: The role of autobiographical memories. In K.J. Gilhooly, M.T.G. Keane, R.H. Logie, & G. Erdos (Eds.). *Lines of thinking, Vol. 2,* (pp. 133-143). Chichester: John Wiley and Sons Ltd.

Conway, M.A. (1990). *Autobiographical memory: An introduction.* Buckingham, UK: Open University Press.

Conway, M.A. (1992). A structural model of autobiographical memory. In M.A. Conway, D.C. Rubin, H. Spinnter, & W.A. Wagenaar (Eds.). *Theoretical Perspectives on Autobiographical Memory,* (pp. 167-194). Dordrecht, The Netherlands: Kluwer Academic.

Conway, M.A. (1995). Autobiographical knowledge and autobiographical memories, in D.C. Rubin (Ed.). *Remembering our past: Studies in autobiographical memory.* Cambridge: Cambridge University Press.

Conway. M.A., Anderson, S.J., Larsen, S.F., Donnelly, C.M., McDaniel, M.A., McClelland, A.G., Rawles, R.E., & Logie, R.H. (1994). The formation of flashbulb memories. *Memory & Cognition, 22(3),* 326-343.

Creamer, M. (1993). Recent developments in posttraumatic stress disorder. *Behavior Change, 10, (4),* 219-227.

Creamer, M., Burgess, P., & Pattison, P. (1992). Reaction to trauma: A cognitive processing model. *Journal of Abnormal Psychology, 101, (3),* 452-459.

Epstein, S. (1990). Beliefs and symptoms in maladaptive resolutions of the traumatic neurosis. In D.Ozer, J.M. Healy, & A.J. Stewart (Eds.)., *Perspectives on personality , Vol 3,* London: Jessica Kingsley Publishers.

Foa, E.B., Feske, U., Murdock, T.B., Kozak, M.J., & McCarthy, P.R. (1991). Processing of threat-related information in rape victims. *Journal of Abnormal Psychology, 100,* 156-162.

Foa, E.B., & Kozak, M.J. (1985). Treatment of anxiety disorders: Implications for psychopathology. In A.H. Tuma & J.D. Maser (Eds.), *Anxiety and the anxiety disorders.* Hillside, NY: Lawrence Erlbaum Associates.

Foa, E.B., & Kozak, M.J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin, 99,* 20-35.

Foa, E.B., & Riggs, D.S. (1993). Post-traumatic stress disorder in rape victims. In J. Oldham, M.B. Riba, & A. Tasman (Eds.). *American psychiatric press review of psychiatry, Volume 12,* (pp. 273-303). Washington, DC: American Press Review.

Foa, E.B., Steketee, G., & Rothbaum, B. (1989). Bahavioral-cognitive conceptualizations of post-traumatic stress disorder. *Behavior Therapy, 20,* 155-176.

Geer, E.B., & Maisel, E. (1972). Evaluating the effects of the prediction-control confound. *Journal of Personality and Social Psychology, 23,* 314-319.

Graf, P. & Schacter, D.L. (1985). Implicit and explicit memory for new associations in normal and amnestic subjects. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 13,* 45-53.

Horowitz, M.J. (1986). *Stress response syndromes* (2nd ed.). New York: Jason Aronson.

Horowitz, M.J. (1976). *Stress response syndromes.* New York: Jason Aronson.

Jones, J.C., & Barlow, D.H. (1990). The etiology of posttraumatic stress disorder. *Clinical Psychology Review, 10,* 299-328.

Kilpatrick, D.G., Best, C.L., Veronen, L.J., Villeponteaux, L.A., & Amick-McMullan, A.E. (1986). *Predicting the outcome of a stressful life experience: Criminal vicitmization.* Presented at the 7th annual meeting of the Society of Behavioral Medicine, San Francisco.

Klinger, E. (1975). Consequences of commitment to and disengagement from incentives. *Psychological Review, 82,* 1-25.

Kuyken, W., & Brewin, C.R. (1995). Autobiographical memory functioning in depression and reports of early abuse. *Journal of Abnormal Psychology, 104, (4),* 585-591.

Kosslyn, S.M. (1975). Information representation in visual images. *Cognitive Psychology, 7,* 341-370.

Lang, P.J. (1977). Imagery in therapy: An information processing analysis of fear. *Behavior Therapy, 8,* 862-886.

Lang, P.J. (1979). A bio-informational theory of emotional imagery. *Psychophysiology, 16,* 495-512.

Lazarus, R.S. (1991). Progress on a cognitive-motivational-relational theory of emotion. *American Psychologist, 46, (8),* 819-834.

Lundh, L. (1995). Meaning structures and mental representations. *Scandinavian Journal of Psychology, 36,* 363-385.

Markus, H. & Nurius, P. (1986). Possible selves. *American Psychologist, 41,* 954-969.

Marschank, M., Richman, C.L., Yuille, J.C., & Hunt, R.R. (1987). The rule of imagery in memory: On shared and distinctive information. *Psychological Bulletin, 102,* 28-41.

Marschank, M. & Surian, L. (1989). Why does imagery improve memory? *European Journal of Cognitive Psychology, 1,* 251-263.

Martin, M., Williams, R.M., & Clark, D.M. (1991). Does anxiety lead to selective processing of threat-related information. *Behavior Research and Therapy, 29,* 147-160.

Masserman, J.H. (1971). The principle of uncertainty in neurotigensis. In H.D. Dimmel (Ed.) *Experimental psychopathology: Recent research and theory.* New York: Academic Press.

McFarlane, A.C. (1988). The phenomenology of post-traumatic stress disorders following a natural disaster. *Journal of Nervous and Mental Diseases, 176,* 22-29.

McNally, R.J., Litz, B.T., Prassas, A., Shan, L.M., & Weathers, F.W. (1994). Emotional priming of autobiographical memory in post-traumatic stress disorder. *Cognition and Emotion, 8,* 351-367.

Mineka, S., & Kihlstrom, J.F. (1978). Unpredictable and uncontrollable events: A new perspective on experimental neurosis. *Journal of Abnormal Psychology, 87,* 256-271.

Neisser, U. (1967). *Cognitive Psychology.* New York: Appleton-Century-Crofts.

Oatley, K. (1992). *Best laid schemes: The psychology of emotions.* Cambridge, UK: Cambridge University Press.

Peterson, K.C., Prout, M.F., & Schwarc, R.A. (1991). *Post-traumatic stress disorder: A clinicians guide,* New York: Plenum Press.

Pillemer, D.B., Goldsmith, L.R., Panter, A.T., & White, S.H. (1988). Very long-term memories of the first year in college. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 14,* 709-715.

Quillian, R. (1968). Semantic memory. In M. Minsky (Ed.). *Semantic information processing,* (pp. 227-270). Cambridge, MA: MIT Press.

Raphael, B. (1986). *When disaster strikes.* London: Century Hutchinson.

Riemann, B.C., & McNally, R.J. (1995). Cognitive processing of personally relevant information. *Cognition and Emotion, 9, (4),* 325-340.

Robinson, J.A. (1980). Affect and retrieval of personal memories. *Motivation and Emotion, 4,* 149-174.

Robinson, J.A. (1992). First experience memories: Contexts and function in personal histories. In M.A. Conway, D.C. Rubin, H. Spinnler, & W, Wagenaar (Eds.), *Theoretical perspectives on autobiographical memory* (pp. 223-239). Dordrecht, The Netherlands: Kluwer Academic.

Roth, S., & Kubal, L. (1975). The effects of noncontingent reinforcement on tasks of differing importance: Facilitation and learned helplessness. *Journal of Personality and Social Psychology, 32,* 680-691.

Ruch, L.O., Chandler, S.M., & Harter, R.A. (1980). Life changes and rape impact. *Journal of Health and Social Behavior, 21,* 248-260.

Ruch, L.O., & Leon, J.J. (1983). Sexual assault trauma and trauma change. *Women and Health, 8,* 5-21.

Sales, E., Baum, M., & Shore, B. (1984). Victim re-adjustment following assault. *Journal of Social Issues, 40,* 117-136.

Schacter, D.C. (1987). Implicit memory: History and current status. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 13,* 501-518.

Staub, S., Tursky, B., & Schwartz, G.E. (1971). Self-control and predictability: Their effects on reactions to adversive stimulation. *Journal of Personality and Social Psychology, 18,* 157-162.

Teasdale, J.B. (1993). Emotion and two kinds of meaning: Cognitive therapy and applied cognitive science. *Behavior Research and Therapy, 31, (4),* 339-354.

Tulving, E. (1972). Episodic and semantic memory. In E. Tulving & W. Doanaldson (Eds.). *Organization of Memory*, (pp. 382-403). New York: Academic Press.

Tulving, E. (1983). *Elements of episodic memory.* New York:Oxford University Press.

Tulving, E. (1985). How many memory systems are there. *American Psychologist, 40,* 385-398.

Wegner, D.M. (1994). Ironic processes of mental control. *Psychological Bulletin, 101,* 34-52.

Williams, J.M.G. (1992). Autobiographical memory and emotional disorders. In S..A. Christianson (Ed.), *The handbook of emotion and memory (pp. 451-477.).* Hillside, NJ: Lawrence Erlbaum Associates Inc.

Williams, J.M.G. (in press). Depression and the specificity of autobiographical memory. In D. Rubin (Ed.), *Constructing our past: An overview of autobiographical memory.* Cambridge University Press. Cited in McNally et al (1994).

Wilson, T. D., & Brekke, N. (1994). Mental contamination and mental correction: Unwanted influences on judgement and evaluations. *Psychological Bulletin, 116,* 117-142.

Zeitlan, S.B., & McNally, R.J. (1991). Implicit and explicit memory biases for threat in post-traumatic stress disorder. *Behavior Research and Therapy, 29,* 451-457.